

COSATI in 1968

In 1968, COSATI, by all available measuring techniques, had another successful year. The Director of the Office of Science and Technology, Dr. Donald F. Hornig, continued to show interest in information and communication matters. The Federal Council for Science and Technology was steadfast in its support of scientific and technical information programs and the efforts of COSATI to coordinate and improve them. The departure of William T. Knox, Chairman of COSATI, created no disruption as others took over his responsibilities, but his presence was missed by his associates who had admired his drive and his vision, as well as his leadership from the beginning of COSATI.

There were new trends and developments that beset the Federal information community. These resulted from economic and budget pressures during the year. More attention was given to page charges, to increases in fees for Federal scientific and technical information, and to the criteria of performance of information systems. It was not quite as easy as it was in the past to establish Federal STI programs. More justification was needed before new systems could be created. The officials who operated Federal STI programs and facilities began to seek better methods and techniques to manage their programs. Interaction between the public sector STI managers and those in the private sector, non-profit and profit-seeking, increased substantially. In 1968, the private sector was still largely represented by the non-profit professional societies and university programs. The for-profit community, except for publishers, was still in its infancy. During the 1960s, the information processes of the Federal government were not yet the target of the commercial community that they became with the passage of time. There was some concern expressed by the small information industry that the developmental funds provided by the Federal agencies to professional societies to assist them in coping with the information needs of specific scientific communities - this included the payment of page charges to the publishing societies - was inhibiting their growth. Spokesmen from the emerging commercial information-vending sector voiced their criticism of Federal support to the professional societies. Dr.

Eugene Garfield, one of the first entrepreneurs in the private sector, was most articulate in his arguments about Federal 'protectionism,' advocating that the most appropriate way for the Federal agencies to support STI programs was to provide funds, in one form or another, to information users, who would then buy information from the information distributors, in or out of the government. Garfield quarreled with Federal procurement officers, calling on them to use new procedures that would permit information users to buy their data from the private sector free of restrictions. In the meantime, the Federal agencies were much more concerned about creating or extending their information programs, not because they were involved in competition with any group, but because the establishment of programs furthered the accomplishment of their missions. They strongly believed that what they were doing was not only correct, but that their actions were sanctioned by congressional committees, including those that provided authorization and funds, as well as the Bureau of the Budget which approved their budgets within the Executive Branch. Not only did the scientific and technical information systems continue to grow, but in a number of instances, the information systems were required by Congress and were underscored by legislation that detailed what each agency would do to in the information area to advance the intent of the legislation. The growth was accompanied by similar expansion on the national and international scene.

Despite the many gains that were registered during the year, there was recognition that there was much unfinished business. There was still a need for broad-based rationalization of governmental and national information systems. Not much progress had been made in the formulation of policies and an apparatus to assure better coordination of operational systems in the Federal and private sectors. A clear definition of the widening field of information sciences did not exist. Close linkage of governmental library and information service activities had not been achieved. The promise of information analysis centers so enthusiastically recommended in the Weinberg (PSAC) Report a few years earlier remained unfulfilled. Emerging legal problems brought on by new information technology and their impact on society were far from

being solved. The notion that more aggressive use should be made of the STI being generated through government research and development had not achieved critical mass. It was also recognized that the United States lacked policy, thus direction, in the international STI area. Without the achievement of flexible international STI policies, the day-to-day tactics and strategies needed as database development and network construction grew as a global phenomenon were bound to be confused or lacking. The lack of commitment to these needs obvious then continued over the years to the present.

Against this larger backdrop, the positive accomplishments of COSATI and OST during 1968 are described.

The Federal Council for Science and Technology was made up of a number of committees all brought into being to focus on problems and issues in science and technology that involved two or more Federal agencies. Thus, the Committee on Scientific and Technical Information existed because of the knowledge that all of the Federal R&D agencies were developing STI programs, that all of the agencies were rapidly moving into mechanized information systems, some international in scope, that all were experiencing similar problems and obstacles, and that the need to interchange STI to minimize the possibility of overlap and duplication in R&D was a high priority requirement. Each of the other FCST committees were established to encourage information-sharing, coordination and cooperation in specific R&D areas. From the start, it was the policy of FCST to encourage COSATI to consider all of the other FCST endeavors and assist them in their information-gathering and interchange requirements. Thus, to a certain extent, COSATI's function was both internalized and externalized. Agency STI programs were the primary focus, while other agencywide programs whose success would be enhanced by more advanced STI programs, also were to receive COSATI assistance. The task of coordination and interaction with the other FCST committees was a chore for the COSATI officers. In 1968, it was resolved that COSATI would do all in its power to support the other FCST programs short of creating a special group to do so. Because annual COSATI reports

were based on specific projects and programs, hence they do not reveal the scope of the informal interaction that went on between COSATI and the other FCST committees. Occasionally, other FCST committees would appoint information subcommittees to "dig into" special information areas, recognizing that COSATI was not organized to carry out this function for them. Their subcommittee leaders would work closely with COSATI, more often than not, attending its meetings and keeping aware of what was going on in COSATI of value to the FCST activity for which they were responsible. Thus, all FCST committees had access to COSATI and the immense knowledge of information techniques and procedures that could be of help. A review of FCST committee programs that included STI efforts in 1968 included the following: Committee on Water Resources Research, Committee on Solid State Science, Coordinating Committee on Materials Research and Development, and the Committee on Government Patent Policy, among others. Undoubtedly the assistance of COSATI in providing expert information on how to establish and operate information systems was helpful to the FCST committees. The lack of a COSATI-like entity operating at the Executive Office of the President level currently means that this kind of expertise is not available to governmentwide committees operating under the Federal Coordinating Committee on Science, Engineering and Technology (FCCSET). The assumption that those committees that now exist have their own STI management experts is challengeable in consideration of the fact that knowledgeable STI managers in the Federal establishment are becoming rare.

Not only did COSATI work with other committees of the Federal Council for Science and Technology, it also assisted other groups embarked on Federal programs. A case in point was the National Council on Marine Resources. This organization was contemplating an invitation to the Systems Development Corporation to undertake a \$600,000 study. In a memorandum to the Director, OST, Aines reported the gist of his conversation with John C. Fry of the National Council on Marine Resources:¹

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Subject: Activities Report and Information Trends, December 24, 1967.

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There is some question about the objective of the study and just what is supposed to emerge. Is it a masterplan for the Marine Resources Council, an effort to improve the programs of the individual agencies, or a plan to improve communications among the individuals involved in marine R&D? Nor is it clear how deeply into agency information programs the study is supposed to probe or what commitment the agencies are expected to make towards the success of the study or the employment of the product. There is also a question as to how much technical supervision is to be provided the study team. A considerable amount will be required to make it a successful effort. The lack of enthusiasm exhibited by the members of the inter-agency Data Management Advisory Panel at the meeting on December 19th for the study is not a good omen. Because of the large cost of the study, I have sent Mr. Fry a memorandum expressing these and other views to make sure he understands the complexity of the task and the need for expert supervision. A copy was also sent to Dr. Joe Weyl of SATCOM, who is chairman of the Advisory Panel.

In other discussions with John Fry, it was evident that he and the Director of the National Council on Marine Sciences, Dr. Edward Wenk, were appreciative of the candid advice, and took steps to answer the questions posed by the COSATI chairman.

The information analysis center concept was, on the whole, warmly accepted as an approach that would enrich the flow of useful technical knowledge between generators of new knowledge and users who were outside of the invisible college groupments, but who needed or wanted to obtain fresh, high quality STI rapidly. It was unusual to find that there were reputable individuals who had some reservations about IACs. One of these was Dr. Robert J. Howerton, who described himself as a physicist at the Lawrence Radiation Laboratory in Livermore, California, and the chief consultant of the American Institute of Physics Information Program since 1961.

Howerton stated in a letter to Dr. Hornig a few weeks after the COSATI Panel on Information Analysis Centers that he had attended the meeting, enjoyed his remarks and those of the other speakers, but while the government officials did well in presenting their views, the private sector did not do as well. Howerton felt that there were some important and basic concepts about IACs that needed more thought.¹

Howerton wrote:

1 Howerton, Robert J., Lawrence Radiation Laboratory, University of California, Livermore, California, Letter to Dr. Donald F. Hornig, Director, OST, dated November 22, 1968, pp 2.

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The first, and most important, idea which we did not put across is the great disparity in nature of the types of information to be gathered and analyzed, particularly in terms of the organization of the data files. Some fields are self-organizing by their nature; for example, the information associated with nuclear reaction physics. These fields have intrinsic indexing and classification schemes which can be identified easily. Other fields, such as chemical physics, are disparate by nature and do not admit of such easy handling and probably should be dealt with by a descriptor mode for indexing and classification...

The urgency with which certain data are needed varies enormously from center to center even for two closely related fields of science. Thus, for some fields "evaluation" implies informed guessing while for others the same term implies resolution of differences in experimental values to four or five significant figures.

Another great disparity in the nature of IACs is associated with the background required for personnel. In some fields the desired information must be inferred from experiments which had objectives other than determining the specific data required by the center and therefore require highly educated and experienced investigators while in other field, a straight-forward approach is possible and junior scientists can be used effectively.

It was assumed by the government representatives at the conference to be self-evident that a centralized and standardized information center, synthesized from the activities of the smaller centers, is desirable. I seriously question such an assumption.

Howerton admitted that the hardware and the software needed for a centralized information system "provides a mechanism for such an enterprise," and is now available, but it was his view that before anything like that is done the opinion and advice of persons on the working level who have thought about the possibility of linking even two centers should be sought. He suggested that we:

Select a subset of IACs appropriate to a restricted area of knowledge, such as physics, or even as restricted as nuclear physics, and convene another 2-day session in which the problems and advantages of linking centers are frankly discussed. There (the participants) would try to identify the parities and disparities of IAC problems in closely related fields. The same approach should be used with a small group representing different fields.

Howerton concluded with the suggestions that there should be a meeting of representatives already using computer-oriented operating systems and another for IAC representatives located in centers where computers are available, but not yet used by the IACs.

The Howerton letter received considerable attention from the COSATI Panel on IACs and from the OST STI staff and it was concluded that because so much had been said

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about the proposed national system for science and technology at the IAC conference, Howerton was given the impression that there was a plan afoot to tie all of the IACs together in the network. Aines wrote a letter to Howerton¹ to make this point clear. Aines said:

...we did not intend to convey the impression that we were proceeding full speed ahead to design a centralized and standardized information center and we sincerely regret that we gave you that impression.

The letter listed a number of efforts in and out of the government that brought together experts to grapple with the problems and issues that Howerton raised. Also, it stressed the point that the government officials were aware of the difficulties and complexities and the dangers of over-simplification.

Howerton responded to this letter with his own that in summary said:²

Some of my apprehension resulted from the information that OST was charged with an effort to link centers by the use of a common format that appeared in articles in Scientific Research and Industrial Research in 1967, which clearly implied that implementation was around the corner.

The underlying hypothesis pertinent to the suggestions I made in my previous letter was that some action was intended by your office in the way of forcing conformity and uniformity of IAC activities...I was delighted with your statement that "government officials would be presumptuous indeed to try by themselves to devise a scheme for linking centers, or even try to reach agreement on a common machine format." Since such action is not to be taken, much of the urgency I felt when my previous letter was written has vanished.

This episode had a sobering effect on the STI staff in OST, however, because it made us recognize that the Sherwin effort, which was largely focused on government activities, when linked to the national systems for scientific and technological information effort, could be interpreted by outsiders as a bald attempt to re-write the public and private science handling and communication systems in the United States. It was also a relief to find out that Howerton was not, after all, an opponent of the IAC program of the Federal government, but he was a wise scientist who knew how high the mountain of difficulties would be in creating a special information system that would bind them together in a computerized information network through the use of a single common

¹ Aines, Andrew A., OST, Letter to Dr. Robert J. Howerton, Lawrence Radiation Laboratory, University of California, Lawrence, California, January 5, 1968, pp 3.

² Howerton, Robert J., University of California, Letter to Colonel Andrew A. Aines, OST, Executive Office of the President, Washington, D.C., January 19, 1968. pp 2.

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machine format.

When Hornig was informed that Howerton (and COSATI) felt that the issue was considered closed, he had the last word by reminding us, perhaps with a gentle "needle": "But goal
"I thought our/was to introduce as much commonality as possible." This was taken to mean that he still supported the national systems program and we left it at that.

The National Science Foundation continued to be uncomfortable with its arrangement with the Science Information Exchange which it supported at the request of the Federal Council for Science and Technology, but was under the management of the Smithsonian Institution. NSF's effort to bring reforms and improvements to the SIE, as recommended by the Head of the NSF Office of Science Information Service, who, in turn, was receiving the advice of an advisory group, were being blunted by the SSIE management in a variety of ways, mostly in the form of personal intervention with members of Congress, OST staff, and others. To the extent that this was taking place, NSF management became more and more convinced that the most appropriate solution for NSF was to cut its relations with SIE and inviting to gets its funds from some other source. Under these circumstances, it was a welcome effort on the part of OST to call for a Federal research project-reporting study, which, in effect, was a way of appraising the function of the Science Information Exchange. Obviously, NSF did not want to cut SIE adrift unilaterally, since its support of SIE resulted from a FCST agreement. that it chose not to challenge directly. When OST sought the support of NSF's director, Lee Haworth, he agreed to help with the funds for a study and directed his staff to provide administrative and financial support. The matter was discussed by Dr. Charles Kidd, Executive Director, NSF, and Andrew Aines, Chairman of COSATI.¹ Their concern was the tactical value of appointing an interagency advisory group that would make it easier for a contractor to work with formally designated agency focal points during

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Weekly Activities, 6 January 1968, pp 4. (Item 3)

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the course of the study. Haworth appointed Wilbur Burton and William Rawson, both NSF staff members, to play the roles of contracting officers for the study with the understanding that Andrew Aines would act as the technical coordinator of the project. Whereupon Aines prepared the Scope of the Study which was needed so that NSF could send out a request for proposal (RFP) to the contractor community. Aines wrote to Hornig, reporting on the status of the effort:¹

ask Dr. Kidd to

I shall/assist me in getting an advisory group from the agencies assembled to assist us and provide focal points for each agency. We contemplate a study that will last six months and take about three to four people to staff. Our objectives again are to determine best how to proceed with the more universal implementation of the project-reporting system and determine how best to solve the "SIE problem."

Dr. Hornig was pleased that progress was being made and that Aines was conferring with several of the COSATI members in working out details of the charge to the contractor. He wrote to Haworth shortly thereafter, expressing his appreciation for the excellent cooperation that NSF was providing.²

On the international front, OST staff members, first William T. Knox followed by Andrew A. Aines, were representing the United States in the Information Policy Group of the Organization for Economic Cooperation and Development. This group met a few times during the year to share information about science communication programs going on in the 24-countries which had membership in OECD, as well as make recommendations for cooperative actions in a variety of STI areas. OECD had been formed as an offshoot of the Marshall Plan after World War II to restore the economic strength of Western Europe and other countries including Japan and Australia. With the passage of time, OECD had developed a strong directorate of science and technology, in addition to economic and other components. Most of the topics of the agendas discussed by the Information Policy Group focused on governmental STI programs, but from time to time, subjects that were also the concern of professional societies were considered.

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director of OST, Subject: The Week in Review, 14 January 1968, pp 3.

² Hornig, Donald F., Director, OST, Letter to Dr. Lee J. Haworth, Director, NSF, January 22, 1968

One of these topics was chemistry and chemical engineering. All countries considered chemistry and chemical information programs a high priority subject. In the United States, the importance of the chemical information programs within the government and in the private sector was well understood. Elsewhere in this book, the account of how the National Science Foundation had assisted Chemical Abstracts Service, the information arm of the American Chemical Society, to modernize its substantial information program is told. The U.S. representatives to OECD tried to encourage the OECD member nations to accept the U.S. government contributions to the American Chemical Society as a contribution to the OECD community as well. It was agreed by OST, NSF and the American Chemical Society that the ACS should give a presentation to the Information Policy Group's Panel on Chemical Information. In this presentation, ACS would propose the establishment of information centers operating within OECD countries, developing cooperation among existing discipline-wide chemical abstracting services with the OECD, including shared abstracting, closer relations of primary and secondary publications of the OECD community and a search for more economy of production, employment of computers, assembling of project leaders and staffs in each participating country, user-oriented information service center development and organization of an operating consultation panel. Dr. Milton Harris, a long-time leader in ACS, would offer to assist in making available internships at the Chemical Abstract's operation in Columbus, Ohio. There might be some requirement for financial support in the establishment of the international chemical information service, but this did not seem to be unsurmountable in 1968.¹

Milton Harris made the presentation a short time later. On his return, he reported that the French delegate absented himself from the discussions, but he did not know if this was deliberate. On the other hand, there would be representatives from Germany, Great Britain and France who planned to come to the National Library of Medicine to start their training in the MEDLARS system so that this program could be exploited by the

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director of OST, Subject: The Week in Review, January 14, 1968, pp 4.

Europeans. Harris also reported that the OECD countries were generally favorable to the international atomic energy information program proposed by the Atomic Energy Commission earlier.¹ A decision was made within OST not to take a stronger hand would to "sell" the CAS system, but to await whatever developments/take place between CAS and chemical information programs of individual countries. We were concerned that the appearance of U.S. government pressure would backfire. There was also a strong belief that the merits of the CAS system were compelling and that it would sell itself.

The pervasive presence of France in the STI programs of its former African colonies was underscored in a publication of the Federation International de Documentation (FID) in 1966, which showed that France maintained for 13 countries in Africa an information institute whose home office was in Paris. Each of the countries also maintained an information office. France and the other countries stated that only french would be used for correspondence., this in spite of the fact that english had become the most commonly used scientific and technical language in the world. The French organization was the addressee for the 13 countries. It was listed as Le Chef du Service Central de Documentation, Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM), Bondy (Seine), France.² It was to France's credit that it could be expelled from its colonies, but still be able to play a significant role in the scientific, technological and STI programs. of these "independent" countries. This was a form of colonialism, of course. In later years, the Free World and especially the United States, was charged by some Third World countries with "information neo-colonialism" as a cold war epithet accusing them of withholding information, stripping them of indigenous information, and preventing them from developing their national communication and scientific and techncial information capabilities. This was one of the underlying reasons why they began to call for a new global information order through UNESCO,where their votes could determine the direction that

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Weekly Report, dated January 27, 1968, pp 5.

² Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: The Week in Review, January 20, 1968, pp 5.

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UNESCO was forced to follow.

Our experience in OECD and with other international STI activities gave us access to what other governments were doing in the information area and what a high priority they were putting into communication and information policies, processes and practices. It seemed unreal to the small band of information experts in the U.S. government in the sense that here was the United States far and away the world's leader in information and communication, including scientific and technical information, and we were putting considerably less weight on the need for information policies and national programs than other countries. The two major exceptions that come to mind were the U.S.S.R. and Japan, but the latter was to make its mark in this area a couple of years later. To alert U.S. government leaders that we should be expanding our "information bridgehead," when a call was made within the Executive Office of the President for new presidential initiatives, Aines made a recommendation that the President announce "The International Information Year (IIY)," which seemed to be in accord with President Johnson's earlier call for "Networks of Knowledge."¹ In summary, the proposal suggested:

A presidential announcement calling for a preparatory program that would lead to the IIY to be held in 1969 or 1970.

Coordination with Kosygin (USSR) and other heads of states to join him in making a joint sponsoring statement.

Convening a council of groups and individuals working to improve international communication in science, engineering, education and other fields. This would be followed by a world gathering in the United States. Themes for the gathering could be chosen like: Peace through Better Communications, Knowledge to Better Serve Mankind, Towards Better Communications in a Shrinking World.

Find ways to get Congress into the program and request Smithsonian Institution and the National Academies (Science and Engineering to act in concert or individually to do the leg work.

There was no feedback from the suggestion, hence no knowledge of what happened to it. One certainty, IIY did not come to pass and that too was a pity. If the idea was picked up, it might have galvanized action in the United States and in other countries

¹ Aines, Andrew A., OST; Memorandum to David Z. Beckler, OST, Subject: The International Information Year (IIY), January 28, 1968, 1 page.

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Just as Senator (and Vice-President) Hubert H. Humphrey played a key role in the development of Federal scientific and technical information programs, Jack Brooks, Chairman of the Government Activities Subcommittee, House Committee on Government Operations, has to be identified as a key activist in the development of Federal computer and data-processing programs. As early as 1967, Brooks was taking the Bureau of the Budget to task for deficiencies in the Federal data-processing standardization effort, the need for a new generation common computer language, and for insufficient progress in the software area. Brooks has expressed his feelings about what he considers shortcomings in the computer procurement and related areas for decades, but his comments will be limited to the need for completion by BOB of the Federal Government's software inventory.¹ Wrote Brooks:

The Bureau of the Budget must push completion of the Federal Government's software inventory. It has been assumed for years that standardization would bestow countless benefits upon the Federal Government, particularly in the software area... (T)he broad interchange of programs and data offers considerable promise... and advantages. But, their nature and scope have not been authoritatively determined. An inventory of Government software is needed as a data base for Federal Government policies relating to the procurement of next generation languages...

Brooks was aware that "billions in capital investment and in operational efficiency" were at stake in achieving optimum data processing in usage" in both the Federal and the private sectors. Whatever the motives of Harrison and Brooks, they tended to converge in a search for more economical ways of utilizing computers. The former wanted better management of the costly resource, including software, the other wanted more action in developing common use software packages for research and development.

The matter was briefly explored in a visit to Representative Brooks' staff man, Ernest Baynard, by Chalmers Sherwin and Andrew Aines in the latter part of January 1968.² Baynard's (and Brooks') comments were passed on to BOB representatives without further comment.

¹ Brooks, Jack, Chairman of the House Government Activities Subcommittee, Committee on Government Operations, House of Representatives, to The Honorable Charles L. Schultze, Director, Bureau of the Budget, letter dated December 5, 1967, pp 4.

² Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, subject; Discussion with Mr. Ernest Baynard House Govt. Activities Committee staff

leading to improved communication and sharing of information. About 15 years later, England announced something akin to a National Information Year, but this was largely designed to stimulate the British to become more aggressive in competing in the international computer market, a much different objective than the one suggested for Presidential adoption in 1968.

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2.3.5* OST and COSATI did not feel that they had the responsibility to be "cheer leaders" for all STI programs that Federal agencies and other Federal groups were seeking during this period. A case in point was the National Data Program for the Marine Environment. Very properly, this program recognized the need for a well organized and operated information system, but the blueprint for the information system was more a masterpiece of brochuremanship than a realistic statement of need, system architecture and costs. Glenn Schleede and Richard Rettig, both of BOB, were assigned to "watch" the Marine Council information program. Both sought OST-COSATI advice on the National Data Program plan. They were informed, as was the interagency advisory panel involved with the marine data program, that:¹

While OST favored a study in this area, the proposal failed to provide what was needed. The Marine Council failed to provide the tough-minded directions that were needed to come up with a good proposal. Agency reaction was bound to be negative to the support of the marine data system. There was a question about the need for a huge, expensive "capping agency" to operate the system. It might be wiser for the contractor to focus on data programs to solve specific problems of individual components of the marine programs. Unless the total requirement was re-evaluated, OST could not support the data program, sentiment aside.

Up to 1967, the computer community was largely focused on the improvement of computers. Just as concern for supremacy in microchips absorbed the information technology field in the middle-1980s, there was fierce competition in the mainframe business in the late-1960s. But increasingly, during that time frame, recognition was being given to the important role of software in the future. In January 1967, Halstead Harrison, a

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject The Week in Review, January 14, 1968, pp 4.

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computer expert at Boeing Aircraft, communicated with OST on the subject of software needs, which he pointed out were growing and costly, especially when major corporations were being called upon to create many new ones, essentially repeated the work over and over again. It was Harrison's view that OST should encourage the preparation of about 100 basic software programs for computers used in science and technology that would be a national resource valuable for researchers and others in the public and private sectors. There were a few other critics pointing out that there was a lack of research and development in the software area and the need was so great "that steps are being taken for a group at the National Academy of Sciences to study the problem."¹ In the same memorandum, Aines wrote:

A well-known university research claims that the "computer industry is sick." Another points out that Telefunken of Germany has taken a page out of the U.S. book and has used information provided by ARPA to them about interactive computation techniques to attain something of an edge in commercial applications. A well-known securities company, Merrill, Lynch states: In dollar volume, this segment of the computer industry is believed to be as large or larger than the hardware (computer-manufacturing)portion of industry."

Preparatory to making recommendations to Dr. Hornig about actions to implement Dr. Harrison's views, discussions were held with three reputable American experts, whose views are summarized as follows: Professor John C. Licklider (MIT):²

This is a complex problem that will not be solved by just putting a group of programmers on the job. The problem involves compatibility. Whose computers will we build the programs for? The 100 problem packages are vague. Kessler is already doing work for Project MAC for geoastrophysics. Charles Miller is working on a prototype program for integrated civil engineering systems. IBM has a half-dozen people working on this issue, but a fantastic amount of work is needed. The nature of the problem changes as sophistication comes; we may not need 100 problem packages. Perhaps the best way to go is to let the program evolve in 5 to 10 years. I see value in what Harrison says, but I do not support his suggestion.

According to Dr. Robert Taylor, charged with information research in DOD's ARPA, said:

The proposal makes sense in that an accelerated effort is needed, but the cost of \$400,000 is a gross estimate, except if it's for Harrison's own computer and his profession. In its network program, ARPA is seeking to get around this problem of different machines, because at present we need duplicate programs for each machine. The solution involves problem-orient-

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: Weekly Report, 27 January 1968, pp 5.

² Aines, Andrew A., OST, Memorandum for Dr. Donald F. Hornig, Director, OST, Subject: Letter from Halstead Harrison (Boeing), January 22, 1968, pp 3.

ed versus procedure-oriented compilers. DARPA is working on a compiler to create other compilers. There has been some success in this approach at Carnegie and at Systems Development Corporation. ARPA is working at the research level, not applications. Harrison is right about his needs, but wrong about the way to do the job, because his approach is too conventional. Were Harrison at six places where ARPA has research contracts, he could cut his time in preparing a package drastically. Personally, I would argue that the development program is needed now; the government is spending billions of dollars on computers and related costs and only \$25 million a year for research in this area. Only ARPA is attacking the problem raised by Harrison, but this only in the research area. Lots of money is going into working on a language here and a language there. Harrison ought to be asked what kind of a computer operating system he has in mind. OST ought to be interested in the fact that interactive computing techniques have been transferred to Europe as the result of a conference we had in Europe two years ago sponsored by APA. Telefunken has now begun to sell interactive computing techniques.

The response by Dr. Allen Perlis, Carnegie-Mellon, was along these lines:

Harrison's grievance is semi-legitimate. Every physical scientist doing computing has the desire to collect ready made programs, algorithms, etc. to save work; Harrison's pains are typical. Programs are growing in the biomedical field, also nuclear reactor. Bubble chamber packages are being prepared. None are language problems as seen by Harrison. Fields and sub-fields are insufficiently formalized to do very much. Harrison and his compatriots simply do not want to take the time to write codes. His is not a design, but a collecting activity. We are putting money into design of problem-solving language, but the research work going on is slow. The truth is that we have a weak software industry in the U.S., only ARPA and NSF are supporting research in this area. The fledgling software industry, separated from the computer manufacturers, is too new or too poor to do developmental work across-the-board. Much government funds are going into hardware; but not into software. No government agency is concerned with software health; we need a NIH for software, ARPA's coverage is too limited. Result--the whole industry has slowed down and there is sickness. This is why we are pushing hard at the National Academy of Sciences to set up an Ad Hoc Computing Science and Engineering Research panel under Professor Anthony Oettinger (Harvard University).

Aines summarized the three responses as follows:

The three are sympathetic with Harrison's plea but read differently. Licklider is the most conservative and prefers to use the services of "good Father Time. Taylor believes that ARPA is on the right track, but more funds should go for studies in applications to balance those of those going into research. Perlis senses the need for more Federal funds for work in software applications. All identify programs to develop problem packages, but these are as islands in the seas.

Aines prepared a letter of response, thanking him for his suggestion, but stating, in essence, that OST believes that the NAS Oettinger Computing Science and Engineering Research Panel, under Dr. Oettinger, should explore the recommendation more fully. He also advised Dr. Hornig that he would encourage the Oettinger NAS Panel to give the proposal its full attention. This Aines did throughout the life of the Panel.

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Brooks decided to accelerate his effort to "stir" BOB and the Federal agencies into a more aggressive, progressive approach to information management by "leaking" the information that a House study of 15 Federal agencies information programs was being planned. The review would "go through them from stem to stern." Since it was also revealed that Federal scientific and technical information programs would not be given the same treatment. There were two reasons cited; the first of these was that Federal STI oversight was the responsibility of the House scientific and technological committees, and (2) Congressional pressure on STI programs had resulted in very favorable results. The erosion of the Federal STI programs in the 1970s and 1980s is in part, at least, the result of reduced vigilance on the part of the House science and technology apparatus. It should be reported that there was some stirring in BOB insofar as its computer responsibilities were concerned. Bernard Urban, BOB, was directed to prepare a study on management information reporting. Walter Haase was reassigned from NASA to BOB to improve Executive Office and White House information management programs.¹ In discussions with both, it became clear that they did not consider the Federal STI program to be included in their charges.

At the end of February 1968, the Federal Council for Science and Technology members were sent an FCST Policy Paper on the foreign dissemination of STI, a paper prepared by COSATI's International Panel, approved by the members of COSATI, and reviewed by the Federal agencies which were asked to make whatever corrections and revisions they deemed necessary.² The paper was entitled Policies Governing the Foreign Dissemination of Scientific and Technical Information by Agencies of the U.S. Federal Government. It was the first and probably the last of its kind prepared by the Federal agencies. The Purpose of the paper was to "establish a uniform set of policies governing the dissemination of STI to foreign states and entities. STI was defined as unclassified, unlimited, non-proprietary information, covering natural, social

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: Weekly Report, January 31, 1968, pp 4.

² Kidd, Charles V., Executive Secretary, Federal Council for Science and Technology, Memorandum for FCST Members, Subject: FCST Policy Paper, January 31, 1968,

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and information sciences, which is generated by U.S. Federal Government facilities, contractors, or grantees, and which is releasable to foreign countries under terms of the Munitions and Export Control Acts and regulations. Scientific and technical information includes reports, serials, machine-readable information, and machine software used in conjunction with Federally-owned or operated machine systems or their components." The Scope included bilateral or multilateral exchanges and agreements, acquisition of foreign documents, foreign dissemination of U.S. STI reports and serials in both full copy and microform, exchanges of machine indexes, machine software, specialist information personnel, and utilization of foreign machine systems. The policy statements applied to all agencies and departments of the Federal government, but excluded individuals in the Federal agencies or contractor personnel engaged in personal exchange of open and unclassified information with similar individuals in foreign countries.

The Objectives of the policy statement were designed to advance the missions of the Federal agencies, the overall foreign policy of the United States, and specific national objectives in the field of STI. More specifically the policy objectives called on the agencies to:

1. Ensure that there exists within the United States at least one accessible copy of each significant publication of the worldwide scientific and technical literature.
2. Establish international STI systems through which the worldwide scientific and technical literature will flow routinely into the U.S. elements of the systems.
3. Influence and encourage the establishment of standards so that foreign information systems and those of the U.S. are compatible.
4. Utilize STI efficiently in support of agency missions, and in support of overall U.S. objectives in raising the economic and industrial standards of other countries.

The specific Policies agreed upon by the Federal agencies were as follows:

1. The U.S. seeks the widest possible dissemination of knowledge, and in particular, the open exchange of STI.
2. Agencies shall seek a reasonable return, which may be in the form of publications, information, materials, services or money. Agencies will refrain from widespread, free distribution, but shall take into account the capability of the foreign entity concerned to make this return. Agencies are encouraged to supply or distribute free materials in support of specific foreign policy objectives, such as assistance to developing

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countries. Agencies may, at their own option, answer requests with free materials, and may utilize selected free distribution as necessary for accomplishment of their statutory missions.

3. Where international cooperation is sought in attainment of the objectives (set forth above), preference shall normally be accorded to multi-lateral arrangements if they proved means as least as effective as bilateral arrangements.

4. Agencies shall promote international agreement on the use of the most commonly used language for scientific and technical communication. At present, that language is English.

5. Agencies shall, as appropriate, encourage the participation of qualified U.S. citizens in the official structure of international organizations concerned with scientific and technical information.

6. Agencies that qualify as lead agencies in various scientific and technical subject matter fields, such as nuclear energy, agriculture, and health, have primary responsibility for meeting U.S. objectives which apply to their subject matter area. However, the agencies shall be subject to foreign policy guidance of the Department of State.

7. Agencies shall maintain adequate lists and statistics on international exchanges so that progress toward achieving U.S. objectives may be estimated annually.

8. Lead agencies in specific subject areas will assume responsibility for keeping other agencies informed of any significant development in their relationships with other nations or international organizations, including proposed international activities of a significant or precedental nature.

9. Exchanges, arrangements, and agreements with the nations of Eastern Europe, the U.S.S.R., and unrecognized regimes proposed by Federal agencies shall be coordinated in advance with the Department of State, subject to the regulations established for such exchanges.

10. Policies contained in this paper shall not be construed as superseding any statute or Executive Order.

The contents of the 1968 policy paper have been described, with a few changes to condense the document, because of the importance of international STI exchange in the mid-1980s. It could be said that with the end of FCST in 1973, the agreements were no longer relevant, since OSTP and FCCSET had not renewed them. On the other hand, there is at least a suspicion that OSTP and FCCSET are unfamiliar with the policy statement and would agree with most of the individual policies if not all of them.

The climate in which the FCST policy on foreign dissemination and interchange of STI became a reality obviously was different than it is currently. There are now more strictures on unclassified, unlimited and non-proprietary dissemination of STI. Less STI prepared by contractors would enter the pool of world literature. The emer-

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gence of OMB as the leader in the formulation of Federal information policy might influence the retention of the FCST policy or a derivative of the original policy. OSTP, in spite of its responsibilities in the STI area in its legislation, has not been active in this area, the one exception being in participating in the 1984 dialogues that sought to reduce the flow of vital STI to unfriendly political regimes. OSTP has also been at least tangentially involved in seeking improved policies and practices in handling "intellectual property." Without an inherent concern for Federal scientific and technical communications in all its manifestations, without a full-time, aggressive and knowledgeable STI focal point, and without the personal involvement of the Director, OSTP, there is little expectation that the FCST Policy Paper of 1968, dealing with foreign dissemination and interchange of STI, would be updated and re-issued. The probability that the political climate will change rapidly to make this possible must be assessed as low. One other factor has changed considerably over the years. During the mid-1960s, there was considerable zeal to create new information systems and data bases for science and technology. Establishment of a new major system was something to be celebrated. Currently, a "chilling" has taken place - the enthusiasm for new systems has fled. Administrative and budget personnel can now intervene in the process to make it nigh impossible. Preconditions are now in force that require new information systems proposers to prove that new information systems will be self-supporting and that the private sector is not the best mechanism to undertake the development and operation of the information system. Thus, the change in criteria militates against the establishment of new STI systems that are designed to operate in the international arena. It is expected that the lack of vision, now so apparent on the Federal scene, will haunt the United States in the future. Professional scientific societies will continue to operate discipline-based information systems; information vendors continue to improve their capabilities of "vending" data bases that are already in place, in contrast to creating new ones involving science and technology; but the Federal agencies will find it harder and harder to create new STI systems to conform to changing directions and

requirements of ever-changing science and technology.

In playing its leadership role, OST found it necessary not only to monitor the Federal agency STI programs and keep COSATI energetic and progressive, it was also being required to "cast a net" into likely future developments of importance to its multi-mission. This function was taken very seriously. There were many predictions being made during this era, but most of them involved the larger field of information technology, especially the proliferation of new generations of computers, software and peripheral equipment. In response to a suggestion from Dr. Donald Hornig, Director, OST that we think of communications in the Year 2000, a short list of expectations was provided him.¹ The one-page product was intended only to stimulate his own thinking on the subject, which was increasing with the passage of time. Some of the thoughts are listed:

The vision of President Lyndon Johnson for a world network for knowledge will have largely come to pass. Networks of all kinds will have provided interconnections, switching centers, computerized banks of knowledge and a huge, new industry will have emerged to develop, maintain, and service the networks.

The business of the world will be handled in ways we are just beginning to see today. The costs of communications will have been reduced by means of communications satellites and other equipments to the point that communications will begin to replace commercial travel. The postal system will have undergone considerable change to use new information technology techniques. Data banks of all kinds will exist that can be tapped from remote locations. The day of the computerized information utility will have arrived.

Universities will be interconnected in a variety of ways and knowledge will be shared on a worldwide basis. Congress will be computerized and will obtain its information from the growing networks. To a considerable degree, cities and states will be bound together in communications networks.

The use of satellites to sense and communicate information of all types will have expanded considerably. Considerable knowledge will be reaped from our space programs in the last quarter of the century.

The underdeveloped nations will have undergone more transformations than even the most optimistic observer would have imagined, but as is the case in all social and economic upheavals, considerable discomfort accompanied

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald, F. Hornig, Director, OST, Subject: Communications in the Year 2000, February 1, 1968, pp 1.

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The DOD STI program was seriously affected and the loss of Carlson from COSATI was also painful. There were a number of discussions with McArthur about speeding up his recruitment process. Aines wrote to Hornig during this period:¹

Don McArthur laments that hiring freezes have resulted in tieing his hands in bringing people aboard to rescue his faltering STI program. I urged him to bring one person from each of the three services aboard without delay to bolster his staff and service notice to the military services that ODDR&E leadership will be maintained. His present staff is inadequate. McArthur asked me what I thought of the Raymond Report (a DOD study of its overall STI program) which was so critical of McArthur's stewardship. I answered that the findings of the report seemed to me, with a few exceptions, to be accurate and affirmed without question the concern that OST-COSATI had for the quality of the DOD program. If McArthur is not able to strengthen the program in the next few months, we may want to suggest to John Foster (Director of Defense Research and Engineering) that he might want to shift the responsibility to one of his other offices.

Some stability returned to the DOD STI program when Walter C. Christensen became the Director of Defense Technical Information, but while he was steady and worked hard, he lacked the flair and other talents of Carlson. His contributions to COSATI were considerably less, unfortunately, and the lack of entrepreneurship that was a hallmark of Carlson had a negative effect on COSATI. Up to this point, the DOD had the strongest program among the agencies and acted as something like a role model for the other agencies. Although DOD had the largest research and development, hence STI, program in the Federal government, the loss of Carlson and the failure to replace him with an equally talented person proved costly over the years. DOD's leadership in the Federal STI community has never returned to the level it enjoyed during the early and mid-1960s.

The departure of Dr. Donald Schon, the COSATI representative from the Department of Commerce, from that agency to take on a new post in the private sector, was another loss, both to his agency and to COSATI. At the time of his departure, the Department of Commerce lost the services of a splendid public servant, who, like Carlson,

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Item 5, Weekly Activities, 6 January 6, 1968, pp 4.

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these changes. The standard of living of a large part of the world will have advanced tremendously, but many pockets of poverty will remain to be eliminated.

We will have had a considerable number of international scientific and technological programs of a joint and shared character. A number of programs akin to International Communication Year (ICY) programs in a variety of areas to facilitate the growth of networks for knowledge. As the fruits of the communications explosion of the 1960s are harvested, we will be even more conscious of the meaning of the "global village" resulting from the rapid "webbing" of communications.

One of the purposes of exploration, such as the one above, was to instill a sense of excitement in the Federal STI community, a belief that through their actions progress would be ensured, and a feeling that the best days were still ahead of us. Some of the predictions have come true, while others are still to be achieved. For a couple of years, the Federal STI community responded, but ultimately conditions, most of them man-made, accumulated like dark clouds before a storm, and the era of Federal STI program development began to draw to a close.

The unraveling started with the departure of Walter Carlson, Director of Defense Technical Information, in 1967. Carlson was a tough-minded engineer, who had earlier become involved with the Engineers Joint Council and other engineering societies in information system development. He was brought into the Office of the Secretary of Defense and operated under Admiral Martell and later General Ely when they were chairmen of COSATI in its earliest days. Carlson was a bundle of energy, an excellent thinker, a splendid writer, and, above all, knew how to work with others to get a job done. The series of DOD directives and regulations pertaining to technical information that he prepared shook up the Department of Defense and stimulated a DOD-wide STI program that was powerful and unique. Carlson threw the same kind of energy into the COSATI development program. Martell and Ely had considerable respect for Carlson, who recognized that both of them were near the top of the Office of the Director for Defense Research and Engineering. Carlson decided to cast his lot with IBM and moved to California to take up his new duties.

Dr. Donald McArthur, an Assistant Director in ODDR&E, was Carlson's superior, hence responsible for replacing him. Unfortunately, this became a long drawn-out process.

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was blessed with entrepreneurial skills. His loss was felt by his Department and by COSATI.

Another loss was Dr. William Stewart, the Surgeon-General of DHEW, who took on the role of COSATI representative from his agency because of his great interest in scientific communications matters. It was difficult to lose him and these other talented officials from the COSATI roster; with the passage of time, they were sorely missed. It was a constant battle to convince the authorities in the R&D agencies to provide successors to these and other individuals who established COSATI in the early 1960s and made it successful. It was very obvious to the OST STI staff that when the Federal agencies chose persons who were able and authoritative in their agencies to serve in interagency groups, like FCST and its committees, they were investing in focal points who could command the allegiance of all of the persons involved in STI in their agencies.

There was no longer any question about Congress getting into the use of mechanized information programs. First, it was increasingly sensitive about the number of computers and data systems employed in the Executive Branch, compared to the few in use by Congress. Second, the paperwork burden on Congress was growing apace. Third, committees and individuals in Congress began to recognize that information interchange in the future would be mainly computer-to-computer transactions, and Congress, by not employing computers for this purpose, was in the unenviable position that developing countries find themselves in, vis-a-vis the advanced countries fully equipped and using computers increasingly and successfully. In 1968, there were several bills in Congress that would enable the Congressional Research Service to procure and use ADP equipment. At a COSATI meeting held in mid-February 1968, Robert Chartrand, Legislative Reference Service (now Congressional Research Service) stated that Congress would start developing information systems to track the status of pending legislation, prepare current schedules of committee and subcommittee activities, maintain files of authorization and appropriations data, and many more applications of importance to Congress. Chartrand estimated that some of the new systems would be

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in place within a year or two.¹ After the Chartrand presentation, Aines wrote to Hornig describing the statements made by Chartrand and added the following:

I contend that a Congress equipped with computers and information systems specialists will evolve in a few years into a different kind animal, and that, in turn, there will be a shift in relationships with the Executive Branch and other organizations. I furth contend that it would be desirable to organize an Intergovernmental Information and Data Committee now to provide coordination in the growth of the information-handling programs in all three branches of government. The President (President Johnson) might take the initiative to try to bring the IIDC proposal into being. More than STI are involved, thus BOB might take action in this field, as well.

It had been Aines' contention that the country would be better served if the two major branches of government learned to work together in the handling and sharing of information. The introduction of new information technology provided an unparalleled opportunity to balance the picture and make it easier for Congress to obtain information it needed for legislation and oversight purposes. It would not end the information "war" going on between the two branches, but would facilitate improved communications and benefit the taxpayers at the same time. If the Aines' suggestion received further attention in the Executive Office of the President, there was no overt sign of it. Perhaps, the suggestion was naive or misunderstood, but there was no response. While data-sharing has increased in subsequent years - budget data is the most dramatic example of computer-to-computer communications - there is a lingering feeling that if the proposed Intergovernmental Information and Data Committee had become a reality years ago, the cost of governance might have decreased and productivity increased.

The DOD problem was not being solved, one reason being the employee hiring freeze of 1968. To assist McArthur, it was suggested that Aines brief a number of top officials in Military Service R&D programs, the hope being that they would strengthen their STI programs to prevent any further erosion. A meeting was held for this

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: The Week in Review, February 17, 1968, pp 3.

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purpose, a meeting attended by about 20 DOD officials. Among the observations made by the COSATI chairman were the following:¹

The subject of Federal STI continues to be of interest to Congressional committees, the President, the Vice-President, the White House staff, the President's Science Advisor, and the members of FCST.

Perhaps as much as 10 percent of the Federal R&D budget was being spent on scientific and technical information programs. Nobody knows the exact cost, but it is so large that we may move towards STI line items and PPB (programming, planning and budgeting) in the future. Thus, information programs will require good management like any other resource in the R&D function.

Increasingly, information is being regarded as a commodity. This is partially true, but it is too simplistic to think of information as a "thing." The information function is much more than dissemination programs. Every phase of all Federal agency programs is accomplished with information and communication actions. This is true in R&D as in all other aspects of our mission-accomplishing programs.

Hence, your agency STI managers have to be considerably more than disseminators of technical reports resulting from your R&D. They have to be good R&D managers, who are also charged with organizing, monitoring, operating, planning and checking the quality of information and communication aspects of your agency R&D programs.

You should be asking questions like these: How do my STI programs measure up to the best ones in the country? How efficiently and effectively do we in our organizations handle the mechanics of information-handling? How well does my STI manager do his job? Does he understand R&D management as well as STI management? How about his staff? Have I been paying enough attention to him, his program, his problems, and his support? Are we paying enough attention to the information input into our organization, as well as the output? Have I been conducting program reviews? What do I have to know to do this properly?

There is considerable flux and change going on in the STI field. This involves change brought about by new information technology and its use in our information processes. It involves structural changes that follow the infusion of modern information technology and practices, much like 'form follows function,' the staple view of architects. It also means a change in relations between the generators and users of information on an international scale. We are entering a new "Information Age," that will have an inevitable effect on the way scientists and engineers work and communicate.

We, in the Executive Office of the President, are giving high priority to Federal STI, because it makes sense to meet the challenge head on. We hope that you will do the same. We are asking Congress for four new people to carry on our COSATI and National Systems functions. We hope that this will convince you of the seriousness of our intent.

¹ Aines, Andrew A., OST, Memorandum for Dr. Donald F. Hornig, Director, OST, Subject: Briefing Meeting Held with Dr McArthur and Top R&D Officials from the Military Services, February 1, 1968, pp 2.

Did the encouragement to the DOD R&D leadership result in any significant changes in their STI programs? If there were changes, they were imperceptible.

So certain was OST that it would be given the four new spaces it was requesting that plans were being made on how they would be used. In a memorandum to Dr. Hornig, this was detailed.¹ A few of these tasks were as follows:

1. Undertake actions leading to new National Systems inputs.
2. Provide guidance for the Federal agencies in the development of STI programs.
3. Review and monitor the on going agency STI programs and conduct stewardship reviews.
4. Interact with and give direction, as needed, to the (supporting) Systems group at the National Science Foundation.
5. Work more closely with the NAS-NAE Committee on Scientific and Technical Communication, also with other NAS-NAE groups (critical data, behavioral sciences information program and others).
6. Undertake programs to provide better information programs in problem fields: crime in the cities, quality of the environment, pollution clean-up, technology utilization, urban dislocation, and interchange of STI between the Federal, States and city governments.

The six other tasks involved working with academia, professional societies, Congress, the Bureau of the Budget, international groups, and the private sector.

While the OST staff was working very hard on many programs and projects, it was evident that there was so much more that could be done to improve Federal and private sector STI programs. The additional staff would have made the OST-COSATI program so much more productive with direct benefits to Federal and national science and technology, but they were not forthcoming. In a sense, this was the turning point in the Federal government crusade to perfect its STI system. Even if the national systems information program was not included in the tasks, there were many other developments

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Tasks for OST STI Staff, 2 February 1968, pp 1.

short of a national system that could have been made with additional staff. The shortsightedness of refusing Dr. Hornig the additional spaces he requested is being paid for today. The refusal had much to do with slowing down the momentum that OST-COSATI had built up in the early and mid-1960s. It was evident that there was a lack of understanding of the growing power of STI and the dynamics of the information revolution still not understood by the leaders in the science, technology and governance. But even with the problem of non-support acting as a depressant, we were heads and shoulders above where we are in the late 1980s.

To make certain that his STI staff was on the right track early in 1968, Hornig asked for a list of accomplishments and actions that would sustain his strong support of the STI program. Such a list was furnished him.¹ Here are a few of the items:

1. Assisted in the development of the Water Resources Information Center that will be serviced by the Department of Interior.
2. Helped in formation of the National Libraries Task Group to develop common programs, sharing of resources, and developmental tasks. The Group set up by the three National libraries for this purpose is now functioning.
3. Assisted in the development of the National Data Program for the Marine Environment. Systems studies are underway.
4. Because of the magnification of problems resulting from the shift to computer-based information systems, the COSATI and Sherwin groups are formed to seek actions to permit easy interchange of STI in machine language.
5. Groups were formed to improve agencywide dissemination of unclassified STI, and to develop a total technology utilization program bringing together all R&D agencies, the State Technical Services Office and the Small Business Administration.
6. Actions were taken to work more closely with Congressional groups: Congressman Daddario in development of the Smithsonian-House study group, Congressional Reference Service in discussing use of new technology by the Executive and Legislative Branches, and with Congressman Brooks in the area of computer and other standards.
7. Undertook actions to increase the flow of current Federal agency project information into the Science Information Exchange (SIE).
8. Made recommendations regarding the development of a fee system for Federal STI to reduce the flow to the "pack rat" fringe without seeking full reimbursement from all users.
9. Made contributions to the Network for Knowledge program.
10. Took steps to improve coordination with BOB on STI matters.

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: A Summary of Actions and Accomplishments Pertaining to STI Programs, February 3, 1968, pp 2.

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Apparently, the response to the Director, OST, was acceptable and he continued to show his support for the program.

When the COSATI Task Group on National Systems began to develop the blueprint for a national information system for science and technology, it called a meeting of the top library association leaders and invited them to form a group to interact with the COSATI panel. Such a group was formed, the Ad Hoc Joint Committee on National Library/Information Systems (CONLIS). Its members were the heads of such groups as the Special Libraries Association, the Association of Research Libraries, the American Library Association and others. In 1967, CONLIS prepared a report, Improving Access to Information: A Recommendation for a National Library/Information Program. The report stated that the recommendations made by the COSATI task group did not take into consideration the needs of social scientists and those in the humanities. It pointed out that there were a number of library programs to improve nationwide access to information. The report agreed that strong Federal government action was needed, that there was no agency within the government with responsibility and authority over the total information problem, that newer technologies have to be used, that long range planning is needed along with sufficient resources for application and development, that the magnitude of the task is great and many of the problems are outside the world of libraries, that more and better people are needed in the field, that any future system should build on the present one, that an international approach needs to be taken, that there be universal access to knowledge, and that there should be a national lending library system to provide such access. To accomplish these objectives, CONLIS called for the establishment of a National Library-Information Agency that would be placed in DHEW. In effect, the CONLIS report, like the COSATI National System task group's report, asked for a "capping agency." For some reason, the CONLIS leaders did not its report to COSATI. It was sent to COSATI by Dr. Frank Shick, then the head of the Library School at the University of Wisconsin, for information. After digesting the CONLIS report, Aines sent a note

to Hornig, describing the report and stating his belief that:¹

Since the CONLIS group did not desire to confer with COSATI or provide it with the report, it seem evident that concrete steps must be taken to improve the mechanism for coordination. For this reason, I am going to propose that we set up a COSATI task group composed of top government librarians, particularly those in the research and special libraries sector, and invite the heads of the Special Libraries Association and the Association of Research Libraries to act as consulting members.

Obviously, the members of the National Systems task group were disappointed with the response of the library organization leadership, but they recognized that many librarians were fearful that the ascension of the COSATI effort, and its recognition in high places, would somehow be injurious to them. It turned out that the fear was groundless with the passage of time.

Determining that the Information Revolution was not a flash-in-the-pan, the Bureau of the Budget began to show more concern about its own and Executive Office of the President information processes. Up to this point, BOB gave rather low priority to programs in this area. A BOB Data Systems Office was formed under Walter Haase, a recent arrival from NASA, and Bernard Urban, who had been in BOB for couple of years. A meeting was held with Haase and Urban, largely to bring the former up to date on the OST-COSATI program, but also to learn more about what BOB was thinking of doing in the information field. Haase reported that he was going to modernize the White House information programs, those of the Executive Office of the President, and the program of the Council of Economic Advisors. He also would try to use modern information technology in handling the budget, to assess performance against requirements, and to provide catalytic action for integrating PPB (programming, planning and budgeting) and in systems building. He hoped to find meaningful information packages to explain and control budget data and to provide a feedback mechanism. He expected to obtain a small budget management fund and bring aboard a small but capable staff. He was counting on financial help from several agencies prior to getting his

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: The Week in Review, February 17, 1968, pp 3.

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own line item budget in the FY 1970 Federal budget. Haase talked about other projects, one of them being the Vice President's Handbook for Local Officials. Haase and Urban were given a complete description of the OST and COSATI information programs and were urged to come to the OST-COSATI meetings and work closely with our information community.¹ The invitation was accepted only on occasion, when there was a COSATI meeting that scheduled subjects of interest to the BOB Data Systems Office. What interest there was in BOB in STI matters was discussed with the budget examiners group under Young and Loweth, especially as the Data Systems Office focused its attention on procurement and standards for computers. Interestingly, the two groups exhibited only minor concern in overall information management during this period. It appeared then, as it does now, that the notion of overall information management in science and technology was and is not well developed in that organization, perhaps because it is a special field that calls for expertise in science, technology and the information arts and sciences.

One scientist who has been perceptive about the impact of the Information Revolution is Dr. Philip H. Abelson, who until recently was the editor of Science, the flagship publication of the American Association for the Advancement of Science. For more than two decades, Abelson has observed and reflected on changes in science communications in editorials read by millions of scientists, engineers, educators and others around the world. In an editorial - Custodians of Knowledge - Abelson observed:²

This generation's major contribution in human heritage is a great fund of new knowledge and the means of using scientific principles effectively. This knowledge was accumulated at a cost to society of billions of dollars, and scientists should consider how the facts that have been discovered can continue to be made available.

Abelson stated that scientists were worried about the flood of publications and how to stay ahead of what new knowledge is developed in a scientist's own field, as well

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Weekly Activities, February 4, 1968, pp 5.

² Abelson Philip H., Editor of Science Magazine, Article, Custodians of Science, in Science, 9 February 1968, Vol.159, Nr. 3815, pp 1.

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as in adjacent or distant fields. He found that scientists were looking hopefully at electronic data processing and reliance on invisible colleges." The latter network provides critical and reliable information, which is obtainable with a few telephone calls. To beat it, computer technology has far to go to match it in effectiveness and cost. Abelson went on to point out that it is not always easy to maintain the "invisible college" as fads and fashions in research shift and change He said:

At one time, most areas of physics were depopulated as the majority of physicists turned to nuclear research. Today (1968) the center of attention is solid state physics. ...Today the latest fads in research enjoy support and attention. In considering priorities for support of research, we should recognize and weigh the desirability of maintaining at least minimal activity in all fields of science. We should also consider how the present human information network can be made even more effective.

It would be pleasant to state that the challenge laid down by Abelson was picked up and the notion of human information networks began to receive attention. It was not, of course. There has been a de facto impact as a result of the proliferation of small computers, which when married with telecommunications facilitates the increase of sharing between scientists and engineers by making information requests and exchanges less dependent on real time, but this extension is a far cry from the one proposed by Abelson. Perhaps, attention will be forthcoming in the near future as scientists begin to examine progresss and problems in communications once again.

That scientific and technical information matters continued to have priority in the Office of Science and Technology is revealed in congressional testimony made by Don Hornig in early February 1968. Dur ing his budget testimony to the House Appropriations Committee, Hornig stated:¹

The President last year assigned to my Office the responsibility to assist him in the planning, development and coordination of means for the more rapid and efficient dissemination of STI. The annual national investment in R&D is \$23 billion, \$17 billion of which is spent by the Federal Government. This is the index of the immense current outflow of information -- the work product of the Nation's laboratories. We are seeking funds for a four-man staff to perfect techniques for making this wealth of knowledge available to those who can put it to use. The Federal Government spends

¹ Hornig, Donald F., Director, Office of Science and Technology, Statement of Dr. Donald F. Hornig, Director, OST, Executive Office of the President Before the Independent Offices Appropriations Subcommittee of the House Appropriations Committee, February 5, 1968, p. 11.

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more than \$400 million per year on information problems, and there is no place in the Government outside the Executive Office of the President where information problems and their solutions can be considered as a whole. Someone has to keep the separate efforts from going off in all directions and relate them to the extensive activities outside the Government. OST has made a start with the assistance of COSATI, Federal Council for Science and Technology. OST will engage in the core of work relating to policy, overall planning and ratification of standards. Everything else will be done in agencies outside the Executive Office. The main burden of effort on systems R&D applicable to many systems, technical work relating to standards, etc. will be done by NSF. We plan on carrying out OST's central functions with four professional people plus secretarial support.

Hornig reminded Congress during his presentation that he had requested funds for additional personnel in 1967, the year before

to assume a more direct role in the planning, development and coordination of systems for handling scientific and technical information throughout the Federal Government and in collaboration with private organizations.

In spite of all of the pressure being put on OST and COSATI to upgrade Federal STI efforts by Committees and members of Congress, the additional spaces were not made available in the FY 1969 budget by the House Appropriations Committee. This refusal obviously had a chilling effect on the OST's decision to provide leadership in the national systems approach. Undoubtedly, this congressional decision put a blanket on OST- FCST resolve to extend the Federal STI program.

One significant comment in the Hornig statement was his reminder to Congress that the President had assigned him responsibility to assist him in the planning, development and coordination of means for more rapid and efficient dissemination of STI. When and how this charge was made to Hornig is not known, but it probably was the first and last time that a U.S. president had signalled his interest in more progress in the STI field.

In the meantime, COSATI business continued without interruption, As of 31 January 1968, there were seven panels and four task groups in being:

- Panel on Operational Techniques and Systems (#1)
- Panel on Information Sciences Technology (#2)
- Panel on Education and Training (\$3)

¹ Aines, Andrew A., Chairman, COSATI, Memorandum for COSATI Panel and Task Group Chairmen and Executive Secretaries, Subject: COSATI Roster, February 5, 1968.

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- Panel on International Information Activities (#4)
- Panel on Management of Information Activities (#5)
- Panel on Information Analysis and Data Centers (#6)
- Panel on Legal Aspects of Information Systems (#7)
- Task Group on Dissemination of Information
- Task Group on Technology Utilization
- Task Group on Library Programs
- Ad Hoc Task Group on Data

In general, they show the focus of interest of COSATI during this period. As is customary in all Federal agencies, questions arise about the basis of figures and other other statistics that are provided Congress. In a particular instance, Aines was asked to explain the \$400 million figure covering Federal obligations for STI for FY 1967. Aines responded by providing data prepared by NSF's Federal Funds for Research and Development, which had at that time a breakout of agency statistics in the STI area. It turned out that the totals for FY 1967 had increased to \$583 million as additional data were received by NSF from the Federal agencies. The data were listed in a memorandum that was further submitted to Congress.¹ They are provided to underscore the fact that Federal STI costs range far beyond mere dissemination. Costs are also incurred by agencies other than those that are typically identified as the Federal R&D agencies. Examples of non-R&D agencies are: Federal Communications Commission,

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Fiscal Year 1967 Federal Agency Estimates for STI

(2 pages) (reproduced on pp 35 and 36 - 2,3,5)

Library of Congress, Office of Emergency Planning, Small Business Administration, Smithsonian Institution, U.S. Arms Control and Disarmament Agency. Some of these are still in existence and presumably expending Federal funds for STI purposes. As mentioned elsewhere, NSF stopped its Federal STI surveys years ago and Federal STI costs are now not available, even though it is logical to expect that STI costs rise with the size of the Federal R&D budget.

¹ Aines, Andrew A., Chairman, COSATI) to Robert Barlow, OST, Subject: Budget Estimates for Congress, 14 February 1968, pp 3 (plus cover memorandum)

Fiscal Year 1967 Federal Agency (9) Estimates for
Scientific and Technical Information

| <u>Activity</u> | <u>Estimates</u> (in thousands of dollars) |
|---|---|
| Publication and Distribution (1) | 78,000 |
| Support of Publications (2) | 7,000 |
| Documentation, Reference and Information Services (includes Translations and Specialized Information Centers) (3) | 159,000 |
| Symposia and Audio-Visual Media (4) | 34,000 |
| R&D in Information Sciences, Documentation and Information Systems, Techniques and Devices (5) | 37,000 |
| Collection of Natural Phenomena Data (6) (8) | 268,000 |
| TOTALS----- | 583,000 (7) |

NOTES:

- (7) The earlier estimate of \$400,000,000 was updated as additional data were received from the Federal agencies
- (8) This estimate does not include social phenomena data, such as census data, nor does it provide a complete picture of extra-mural (government contractors) data costs, which are difficult to obtain.
- (9) A breakout of agency estimates is supplied by NSF as follows:
DOD 42%, HEW 15%, Commerce 12%, NASA 9%, AEC 6%, Others 16%
- (10) Federal Funds for Research, Development and Other Scientific Activities (NSF 67-19). The source of this information is the National Science Foundation's Office of Science Information Services

Submitted to Dr. Hornig on 14 February
1968 for further submission to Congress.

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(1) Publication and Distribution

Includes professional writing, editing, preparation of final copy for printing, photoduplication, etc. Additionally, cost of transmission of documents, such as mailing and shipping.

(2) Support of Publications

Includes page charges paid to primary journals, special subscription arrangements to maintain primary journals, grants or contracts for conferences, proceedings, monographs, or textbooks.

(3) Documentation, Reference and Information Services (Includes Translations and Specialized Information Centers)

Includes acquisition, collection, exchange, and storage of materials such as journals, books, periodicals, manuals, abstract journals, indexes, and the like. It also includes library and retrieval services, rental or acquisition, and maintenance of specialized equipment; preparation and maintenance of catalogs or other listings; and tasks such as reviewing, indexing, coding, filing, abstracting, announcing, and listings. Translations include costs resulting from translation of documents from one language to another in support of R&D, and the purchase of foreign journals and other translation materials. Specialized information centers include costs for collecting, reviewing, digesting, analyzing, and summarizing scientific and technical information and data in a well-defined, specialized field.

(4) Symposia and Audio-Visual Media

Includes all efforts directed to planning, scheduling, announcing, supporting, conducting, and attending symposia and meetings for discussion and exchange of scientific and technical information. Audio-visual media include cost of motion picture films for R&D, taped talks, or TV film.

(5) R&D Information Sciences, Documentation and Information Systems, Techniques and Devices

Includes development and testing of machines, devices, and techniques for storage and retrieval of information and data; linguistic research, language and machine translations, communication and information theory, systems development, computer programming, network design, etc.

(6) Collection of Natural Phenomena Data

Includes data collected in physical and life sciences, such as precipitation measurements, tide and stream gaugings, topographic mapping, physical and chemical constants, and entomological specimens.

One of the early government efforts to disseminate data in the form of machine-readable tapes was undertaken by the Clearinghouse for Federal Scientific and Technical Information (CFSTI). Among its offerings to the public were the Federal Budget for Fiscal Years 1964 through 1966, tapes prepared by the Federal Communications Commission, the Atomic Energy Commission, Census Housing and Population Data, U.S. Government R&D Reports, and the Government-Wide Index. Both IBM and UNIVAC tapes were made available. In a note to Hornig, Aines reported the development in these words:¹

This is a significant development for several reasons. There will some day in the not-so-distant future a number of magnetic film libraries, similar to the present print libraries. Some of the larger research and national libraries will store increasing numbers of magnetic tape files along with books and manuscripts. Tapes can be shipped physically or the contents can be transmitted electronically.

Aines concluded with the information that an official at the Goddard Space Flight Center had reported an inventory of about 300,000 tapes containing data originated in space. Keeping tabs on these data was then becoming a problem in 1968. The ability to rapidly gather such data was beginning to surpass the agency's ability to comfortably store and intelligently analyze them. Visits to other data centers storing weather and other geophysical data revealed that this was a shared difficulty.

This problem was given attention at a meeting sponsored by the Office of Science and Technology in early February 1968 on the role of such data centers as the World Data Center (A) at the National Academy of Sciences, the Oceanographic Data Center, the U.S. Environmental Data Centers, and the planned U.S. Marine Data Center. Some of the operations of these centers were international in scope, a factor that magnified the problem considerably. It was decided that the directors of the U.S.-based centers should be invited to join Dr. Edward Brady's COSATI Panel on Information Analysis Centers, either as members or in a sub-group on data centers (Numerical). Some pro-

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: Clearinghouse to Sell Magnetic Tape to the Public, February 11, 1968, 1 page.

gress was initially made, but on the whole, results were disappointing. One of the reasons for this was what seemed to be an unwillingness of the directors of the major data programs to identify and work in a formal manner with one another. There seemed to be some apprehension that their status as scientists would be diluted if they interacted too closely, even though they shared many similar problems in data resource management. With the disappearance of COSATI a few years later, there was no group in the Federal government (or the private sector) willing to seek progress in this area. The condition continues to prevail.

that

Returning to 1968, COSATI determined/the need for a stronger international information program required increased action by its Panel on International Information Activities. The Panel was asked to establish several study groups on the use of P.L. 480 funds, foreign-produced STI, annual inventories of U.S. international information exchange programs, and the preparation of U.S. international information objectives and strategies. The Panel was asked to take the following additional actions:¹

Identify U.S. policy with respect to the development of worldwide networks to exchange technical information and data.

Obtain adequate intelligence about the plans and activities of government and non-government groups which participate or plan to participate in the international information transfer process.

Wider participation of U.S. non-government leaders in the formulation of U.S. STI policies and in coordinated execution of U.S. plans.

Wider participation of the Federal agencies in the consideration of U.S. STI proposals and strategies.

More frequent Panel contacts with technical information leaders, domestic and foreign, to achieve better understanding of their views and objectives.

Starting with the pioneering of William Knox, OST was playing a significant role in the STI program of the Organization for Economic Cooperation and Development. On his departure from OST, the task was turned over to Andrew A. Aines. During the 1960s, the STI programs of the U.S. government were highly respected and every effort was being made to assist the members of OECD, through the Information Policy Group, to

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Subject: Week in Review, February 11, 1968, pp 1-2.

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achieve progress in their own programs. When Dr. Donald F. Hornig was invited to make a presentation to the OECD science and technology committee, David Beckler, his executive officer, suggested to Aines that he provide Hornig with some views on science communications, views that he could advance during his presentation. Aines responded to the invitation in the form of a "think paper" that he presented to Hornig for possible inclusion in his general remarks about science and technology. A few of these thoughts are presented below.¹

We are embarked on a course leading to the development of a number of Networks for Knowledge. This, we think, is a worthy objective for all nations..Some countries might mistake the nature of the game if they think that that they will gain by creating STI systems that take advantage of their neighbors. National information systems are not synonymous with nationalistic systems. To rapidly attain the world's technical knowledge, they would be wise to develop quick-coupling information systems. Building one-way systems is wrong. It may be more costly to build secrecy into information systems that employ elaborate and costly equipment to safeguard the knowledge. In a shrinking world, devising withholding systems is hard to accomplish. World amity means that all countries participate in the exchange of knowledge, thus all international systems should include all nations generating and applying knowledge. Thus, the United States favors actions taken by any group with the same aims, including the countries behind the Iron Curtain. OECD should take the lead here or it must be content with programs undertaken by other groups, like ICSU-UNESCO. OECD should consider sponsoring an International Communications Year (or Years) that will enable countries to get together as they did for the International Geophysical Year (IGY) to apply the fruits of the communications and information technology for the benefit of all people. We should avoid perpetuating an information gap wherein advanced countries will be exchanging technical information electronically while developing countries fall further behind. The amount of resources needed for preliminary studies to build individual information systems, networks, standards and other protocols to achieve compatibility is relatively small. We should get behind the building of a world information system. OECD might want to take the lead in such an endeavor. To do our bit, the United States is willing to provide training and orientation to other nationals as we develop our own program.

To what extent Hornig incorporated any of the above remarks in his talk is not known. There is a strong probability that he did not include any, since there was no play-back from him or from his counterparts in OECD, but no matter, the views represent the

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: A Few Thoughts on OECD and Scientific and Technical Communication, February 29, 1968, pp 2.

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beliefs of his technical assistant and other information thinkers in the United States. Even today, when prevention of STI flow is very much a policy of the government, there is a higher set of logic that resembles the principles that were being expounded in the 1960s.

One of the most important events in February 1968 was the convening of the President's Science Advisory Committee to review what was happening in science communications five years after the release of its Report on Science, Government and Information (the Weinberg Report). Dr. Hornig agreed to a full-day meeting on the subject, which was held on February 20, 1968. Some of the highlights of the meeting were reported as following:¹

Alvin Weinberg wondered if FCST panels and reports have any effect. In his view the only impact of his report was on government, not on the private sector. It was his view that government reports ought to have referee systems if they dealt with scientific applications. The panel view that higher status ought to be accorded to reviewers - the compactors of literature - was not receiving support. Too few scientists and engineers were going into/information-handling. The quality of scientific writing had not improved. He reminded his listeners that the Crawford Report (1962) influenced his own panel. This report urged agencies to designate one focal point with STI responsibility, who would also have financial responsibility for the health of STI activities in fields relevant to government missions. Thus, the Atomic Energy Commission should contribute to the support of physics journals. It was his view that both the Federal government and the technical (private) sector were not managing their STI programs as vigorously as they should.

The next speaker, Douglas Cater, Special Assistant to the President, talked about Networks for Knowledge. Like the President, it was his belief that education was not

¹ Aines, Andrew A., OST, Report of the Meeting of the President's Science Advisory Committee on Scientific and Technical Information, February 23, 1968, pp 5. (The second day of the meeting, February 20, 1968, was devoted to STI.)

exploiting new information technology successfully. Through the use of this technology, it should be possible to educate people better at less cost. There was insufficient attention being given to people on the lower rungs of society's ladder. It should be national priority to find ways to bring learning to a world still living in darkness. New institutional thinking is needed in the White House and elsewhere. He was hopeful that the President's Science Advisor would take a vigorous role in implementing the Networks for Knowledge concept. Cater also talked about public television, the possibility of a tax on television set sales, and a strong effort on the part of public television stations to raise dollars at the local level, since he foresaw a decline of Federal funds for support purposes. Cater did not discuss scientific and technical communication.

Kenneth Lowry, Bell Telephone Laboratory, provided "private sector" views. He saw no shortage of resources in the public sector, but there was a need of more talent to pull things together. He was struck by the competition among the Federal agencies, but was not impressed with coordination between the government and the private sector. It was his belief that there was a lack of quality in STI studies undertaken by the government and too often the solution offered by studies called for even more studies. Coordination was important, but planning even more so; this was a growing concern in Congress. He was concerned about the role of professional societies, since the programs they were adopting might alter the way they handle science communications. Computers were in the cards, but their costs were questioned. There was much duplication and overlap in indexing and abstracting and the private sector was not doing enough about this. The impact on libraries of new costs and many additional information services was a concern, since libraries operating on more or less fixed budgets will find it necessary to drop some services. He criticized the Federal agencies providing grants since they were in a great rush to spend funds before plans, coordination and other requirements were prepared. Too few good people were getting into the information field in the universities. As networks increased in number, the need for standards, switching compatibility, and copyright protection also increased. Some of the

PSAC members in attendance were perturbed because Lowry avoided naming organizations which were being criticized by him. They also wanted Lowry to explain more about the way Bell Laboratories operated and what successful planning and operating experience it had that could be transferable to operations in the public and private sectors.

Robert Cairns, Chairman of the NAS-NAE Committee on Scientific and Technical Communications (SATCOM) discussed the upcoming report of his committee. Brain to brain communications, he suggested, should be the first principle. Secondarily, there was a need for better relations between and among machines and people. More attention was needed for the information needs at the research front. He was attracted to the pre-print efforts of NIH and hoped that technical societies would sit up and take notice of this trend, the desire of scientists and other researchers to get preprint and oral information to overcome the time lag of formal publications. Some kind of an agency to bring more coordination and necessary planning into the secondary services is needed, but he is not sure where it should be positioned. It was inferred that he felt that SATCOM should be invited to play this role. His comments about the DHEW Information Exchange Group were unexpected, but did not provoke any comment from the PSAC members.

Carl Overhage, Project INTREX and Project MAC at MIT, described these programs and their impact on MIT students. He acknowledged the support of the Federal government in what he considered to be valuable pioneering work. He observed that the growth of literature was creating a crisis for libraries and the use of information technology was vital in seeking solutions. He wondered how long individuals expert in the use of computers would put up with the paper and ink medium. The excitement of students in the use of computers was a stimulant to the faculty and a good omen for the future, he observed. Overhage had little to say about science communications, but he believed that government involvement in seeking progress in its own programs and in general was good for the country.

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William O. Baker, President, Bell Telephone Laboratories, stated, after the presentations, that it would be profitable if PSAC re-examined the STI problem, even though COSATI was worthy of praise for its contributions. PSAC, in the past, sought to resolve the muddle of authenticity by bringing more tangibility into the STI picture. Cater's comments were not relevant to the issue, although he had interesting things to say. Other speakers also bypassed the subject of the meeting for reasons best known to them. In 1957-1958, we thought that the Soviets were far ahead of us, but their own STI leadership, Mikhailov for one, have admitted that they have fallen behind and are now looking for a decentralized system. Baker believes that success in the future depends on the extension of a decentralized philosophy. Universities are learning new skills and acquiring new resources to study linguistics, automata, and other pertinent subjects. The United States should sponsor a national developmental program in the Universities. There are new developments in information technology, such as printing with an electronic beam. OST can be the major guide and mentor of the new field as things advance in science and technology, when we will be moving towards remote consoles. We need to get the university regimes involved under cognizance of COSATI. We need firm, unrelenting pressure on coding systems, a la Chal Sherwin's efforts. Librarians will get involved ultimately in the improvement of services. He concluded with the view that any effort dealing with the Network for Knowledge should start off with science and technology, then get into the field of education.

A few days after the PSAC meeting, Aines forwarded a short critique on the meeting to Dr. Hornig.¹

In your opening comments, you asked if there was really a problem in science communications, I hope that you came away from the meeting convinced that there were many. Most of the PSAC members are unaware of the myriads of programs and problems underway in and out of the government to improve STI programs. Among those that are unaware, there is a split between those who want more action and those who are inclined to give lower priority, largely because of their own programs and interests.

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: Weekly Journal and Flashes, Hot and Cold, February 23, 1968, pp 5.

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The cultural artifact, because information is everybody's business therefore nobody's business, cannot prevail anymore in light of the large size and scope of today's information-processing and communications effort. Yet some would approach added involvement with trepidation. As specific STI systems are developed - a process irreversible in the long run - the need for common goals, common languages, convertibility, networking, etc. requires a high-placed group to provide coherence and leadership. This is obvious as we explore the development of Networks for Knowledge. Genuine progress in this area will call for much hard work and human engineering. This is a new front and one beyond the skills of traditional information handlers, such as librarians. I firmly believe that the pay-off in this area merits the attention of all scientists and engineers who are future-oriented and can sense the value and impact of the new information technologies on the way we work and communicate.

I do not know what PSAC can do beyond supporting a study or entertaining some additional presentations. PSAC might want to go on record with a recommendation to the President that his Science Advisor should seek to coordinate all of the components of the growing networks for knowledge. It might set up a small group, headed by Herb Simon who seems to be interested in "keeping PSAC's eye on developments in this area." Finally, it might engage a group of consultants to study specific problems and make their recommendations.

The lukewarm response from PSAC members apparently convinced Hornig to refrain from asking it to make new recommendations for OST action. Baker's call for further action went unheeded. On reflection, the OST staff conceded that its selection of speakers, based on their less than adequate assessment of problems and issues in the total STI field, and their use of the opportunity to describe and "sell" their own programs, was in plain terms a mistake. The once open "window" that brought PSAC into the picture five years earlier had apparently closed, nonetheless, the information revolution continued. The OST-COSATI information community shrugged its figurative shoulders and went on with the task of seeking Federal and national STI progress.

While PSAC took a "lukewarm" attitude about new vistas for Federal STI programs, the Congress took an opposing view. In its report on science, technology and public policy,¹ 12 major problem areas which needed further scrutiny by Congress included "Strengthening Information Management." The Daddario Subcommittee recognized that all R&D information management, including STI management, in the Federal government

¹ Committee Print, Report of the Subcommittee on Science, Research and Development, House Committee on Science and Astronautics, 90th Congress, Science, Technology, and Public Policy During the 89th Congress, Jan. 1965 through Dec. 1966, p. 50.

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needed to be improved. Strangely, almost two decades have passed since the Subcommittee listed the strengthening of information management as a requirement without evidence of a government-wide effort to raise the levels within individual agencies and across-the-board. The current lack of "hard" information about the size and scope of the Federal STI program is a prime example. Government-wide knowledge of the Federal ongoing R&D effort is another. A third involves the tracking of the results of Federal R&D from one year to another. There are many more instances that can be cited of the relatively low priority Federal R&D managers have given to their information systems. Chalmers Sherwin's efforts to improve standards in the handling of Federal R&D is one example. PSAC's indifference to the President's Network for Knowledge crusade was predictable. A couple of years earlier, PSAC was asked if it would support the congressional recommendation of a White House Conference on Scientific and Technological Information.¹ PSAC declined, even though it would have been logical to recommend the White House Conference or an equivalent conference to encourage the Federal agencies and the private sector scientists and engineers to throw their weight behind the recommendations of the PSAC Report on Science, Government and Information (1963). On reflection, many years later, the failure to stimulate PSAC to undertake or recommend others undertake a follow-up program was counter-productive. A strong pronouncement by PSAC on STI program improvement could have possibly arrested the erosion of Federal STI efforts that began to appear a few years later, but this is conjecture only.

While the dissemination of Federal STI seemed to draw the most attention in the activities of COSATI, there were other pressing concerns that needed attention. One of these was the sharing of information pertaining to research and development within and between the agencies. This was always a concern of members and committees of Congress, who were being asked to increase R&D funds annually. Did the failure to

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: Thoughts on PSAC, February 25, 1968, pp 2.

exchange information about proposed work, work in progress, and completed R&D result in duplication and overlap of projects? There was more than a suspicion expressed by members of committees and the General Accounting Office that this was indeed happening. This is why there was always staunch support in Congress for the program and funding of the Science Information Exchange, Smithsonian Institution. Unfortunately, SIE did not function effectively. The Federal agencies were making begrudging input of ongoing research data to SIE, and were not using the SIE database for a variety of reasons - the quality of the database in most/areas, the lack of complete coverage, the use of alternative sources, and some distrust of what they considered a non-governmental entity. While there was some apprehension at OST that the lack of effective and efficient information-sharing was a problem, there was no belief that this was resulting in intentional and wide-spread duplication and overlap. A deeper concern dealt with the belief that the system was too passive, that the use of advanced information technology and techniques would make a difference, and that the overall Federal R&D program would be enriched if there was a faster and easier flow of R&D project information, as well as the STI that resulted from the R&D.

OST was well aware that each of the Federal R&D agencies was employing an internal project-reporting program, based on the use of computers. Each of the programs was agency "unique," which meant that the agencies had to prepare two listings, one for internal and one for SIE use. The SIE format was simply inadequate for internal use, since it had only about 12 descriptive items. The agencies required considerably more data elements /for adequate control. Computer to computer-sharing between the agencies was impossible because the systems were built without intention to participate in a network mode. This unintentional anarchy was one reason why the efforts of Chalmers Sherwin were so attractive to OST, if not to the individual agencies

Working closely with NSF, steps were taken to employ a contractor to study the problem and make recommendations for improvements. The proposed task statement for the

study stated in its work scope:¹

The contractor shall furnish the necessary personnel, facilities, and materials and do all other things necessary to conduct a study of additional actions required to establish an effective Government-wide reporting systems for on-going government-sponsored science and technology projects.

The purpose of a better project-reporting system is to provide an improved tool for managers, scientists, engineers, planners and budgeters involved in governemtn R&D operations. The ultimate goal is to enhance the efficiency of R&D management, and to raise the level of science and technology. Unless devised to make the exchange of project data more efficient and capable of providing data to solve problems and make decisions, there is no intrinsic value to the system. To be successful, the project-reporting form and system should be used and useful at all levels from the bench worker, to the top directors of R&D, to examiners at the Bureau of the Budget, and horizontally to the researchers wherever they are located within the government.

The response to the RFP was gratifying. About 60 prospective bidders came to meeting called by OST and NSF in mid-March 1968. In addition, a number of Federal agencies were invited to meet with Dr. Hornig to provide him with a brief summary of their project-reporting developmental programs. In the meantime, the General Accounting Office once again became interested in the weaknesses of the Federal project-reporting program, this time focusing its attention on the Department of Defense, the DD 1498 reporting system, and its interrelationship with the SIE program. According to Robert Stegmaier of the Defense Documentation Center, its administrator, GAO was asking such questions as: What are the policies and procedures for administering the work unit bank? How adequate and accurate is the input? What is the relationship of the DDC data bank to the data banks of the three military services?² During the period the inquiry was being made, GAO seemed to have a feeling for what was wrong, but its lack of internal expertise in the information area resulted in the kind of recommendations that the agencies could sidestep or claim remedies that maintained the status quo. Hence GAO lost an excellent opportunity to stimulate action in Congress that

¹ Bolton, Wilbur W., Jr., Contracting Officer, NSF, Letter to prospective bidders for a study of governement-wide project reporting systems for scientific and and technical research, RFP- 68-106, March 7, 1968, pp 8.

² Aines Andrew A., OST, Memorandum to Dr. Donald F Hornig, Director, OST, Subject , Report of the Week, March 18, 1968, pp 5.

could have resulted in needed remedial action, or, from another point of view, added more evidence that change was needed in the Federal research -reporting area, as well as within the individual Federal agencies' programs. As an observer of Federal government activities, including those of Congress, it has always been a source of concern that Congress pays so little attention to the General Accounting Office and its studies, thus there are periods when GAO can undertake surveys and analyses that seem disembodied regardless of merit, simply because when they have been completed there are no committees in Congress or individual members of Congress focusing on the particular subject. Results may be better when Congress directs GAO to make a special study in priority areas, but even here interest may be transient and opportunities for beneficial change passed by. This is disturbing, considering the substantial cost of the GAO activity. Insofar as the Federal agencies are concerned, they have become expert over the years in deflecting the thrust of GAO studies, when the findings do not coincide with their own prescription for change.

Project-reporting was also being examined in our international R&D programs. Chester C. Spurgeon, Office of International Affairs, Department of Transportation, discussed with OST the possibility of an ^{a1}international/program for the exchange of transportation research project reports to support U.S. efforts in OECD. He very logically pointed out that there was a considerable amount of transportation R&D going on throughout the world and that it made economic sense for all of the developed countries to exchange technical information, including on going-research projects information. OST agreed and encouraged the continuation of the effort to upgrade the program.¹ OST encouraged the NAS Highway Research Board, which maintained a computer listing of technical information, and OECD which had been toiling in the area for several years. The Science Information Exchange appeared to play a minor role in this area, hence there was not much competition between the two information centers.

¹ Aines Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: Last Week Reviewed, 11 March 1968, pp 3.

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At its meeting on November 1, 1967, the Federal Council for Science and Technology was asked to approve a COSATI paper dealing with policies on the foreign dissemination of STI by the agencies of the Federal government.¹ In March 1968, it was formally released with FCST's approval, containing a few modifications. Its purpose was to establish a government-wide, uniform set of policies dealing with foreign dissemination of unclassified, unlimited, non-proprietary STI generated by U.S. Federal agencies, contractors, grantees, releasable under terms of the Munitions and Export Control Acts. The definition of STI as covered by the policy included reports, serials, machine-readable information, and machine software. The international activities included international, bilateral or multinational exchanges and agreements, acquisition of foreign documents, foreign dissemination of U.S. STI in fully copy and microform, exchanges of machine indexes, machine software, specialist information personnel and utilization of foreign machine systems.

The objective of the document was to advance the missions of the Federal agencies, overall U.S. foreign policies, and to attain such specific objectives as:

To establish international STI systems through which global STI will routinely flow in the U.S.

To influence and encourage establishment of compatible standards.

To assure existence within the United States of at least one accessible copy of each significant global document containing STI.

To utilize STI effectively in support of agency missions and in support of U.S. objectives in raising the economic and industrial levels of other countries.

It was the U.S. Government's policy to seek the widest possible dissemination of knowledge, favoring the open exchange of STI. Agencies would seek a reasonable return in exchanging information in the form of publications, information, services or money. Free dissemination by the agencies was approved, but only to meet other objectives deemed satisfactory by the agencies. Multinational agreements would be favored over

¹ Committee on Scientific and Technical Information, Federal Council for Science and Technology, Washington, D.C., Policies Governing the Foreign Dissemination of Scientific and Technical Information by Agencies of the U.S. Federal Government, P4-67-A-1, November 1, 1967, pp 5.

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bilateral agreements and English would be the preferred language for interchange. Careful coordination with the State Department would be necessary, especially when nations in the communist bloc were involved. Agencies would maintain lists and statistics on international exchanges.

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The policy, when released to scientific and technological organizations and publications, did not stimulate much reaction. John Kenton, Scientific Research magazine called OST-COSATI to find out what was new in the policy; it did not seem to him that the United States was embarked a new course of action. It was explained to him that the codification was a new approach for FCST and the first time that the U.S. Government had announced a fairly liberal Federal information policy. It also called for annual reporting of the extent of exchanges, also for the use of English as the lingua franca of science.¹ In less than two decades, U.S. policy has changed. In the mid-1980s it would be difficult to establish a liberal policy dealing with the dissemination and interchange of STI with other nations; it being the era of the national information "moat."² In all fairness, what the United States did was to retreat from an unusually selfless technical information policy towards one that reflects the reality that other countries did not move to match the generosity of the United States in undertaking a freedom of information crusade as it did in the 1960s.

There were other Americans who felt that President Lyndon Johnson was correct in his advocacy of "networks for knowledge." Almost a "one man" effort was undertaken by an American named Wil Rose, Palo Alto, California, who formed an organization called Data International to serve as a clearinghouse of information for developing countries. According to an announcement by the Voice of America, this organization advised on plant diseases in Thailand, construction of water tanks in the Caroline Islands, curing sheep and llama skins in Bolivia, and about 5,000 other projects in 128 countries.² The information-sharing program was ultimately taken over by the

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: A Brief Look at the Preceding Week and Other Observations, March 31, 1968, pp 3.

² Hillman, William, A World Information Center, Voice of America radio, News and

As seen by a writer for the Scientific Research magazine, April 15, 1968:

The new policy constitutes a manifesto by the United States that STI is a global resource that should be made widely available, and that the United States stands ready to exchange such knowledge as freely as possible. This means literally what it says...The United States is ready to talk with any country, including mainland China about exchanging scientific information -- with no strings attached...The objectives of the new policies are to establish international scientific information systems through which the worldwide STI will flow routinely into the United States, and to influence and encourage the establishment of standards so that foreign information systems and those of the U.S. will be compatible. This is vital..., if science and technology are to avoid an era of computerized information in which a babel of incompatible systems is superimposed on our present-day babel of languages.

³ ~~SECRET//EXCLUDED FROM AUTOMATIC~~ Author Unknown, U.S. Ready for Worldwide Exchange of STI, Scientific Research, April 15, 1968,, page 15.

by the Vita Volunteers for International Technical Assistance, located in Palo Alto, California. Other articles about the contributions of Vita appeared in the New York Times on November 13, 1967, Iron Age (Chilton Publication) on September 28, 1967, Reader's Digest in October 1965, and AAAS' Science September 3, 1965. The effort was a "peoples' contribution" from start to finish, an expression of concern for the needs of humans in want, in this case, information, rather than food, clothing and medicine, the staples of the needy from time immemorial. The significance of this aid program was appreciated as a humanitarian gesture, but what was missed was the recognition that "information need" had now emerged to take its place with food, shelter and medicine as a basic human requirement. Let the record so show.

The support of Congress for library and information programs was very generous during the period of the mid-1960s. An example is the funding that was made available to libraries in and out of the Federal government. Dr. Lee Burchinal, who ran the Office of Information's ^v Educational Research Information Center (ERIC) program, and ¹⁹⁶⁸ who was also an observer to COSATI from his agency, reported Fiscal Year/expenditures amounting to \$484 million in the library field:¹

| | |
|--|--------------------|
| Library Sciences and Construction Act | \$68.0 million |
| Higher Education Act of 1965 | 41.8 million |
| Higher Education Facilities Act | 131.2 million |
| Elementary and Secondary Education Act of 1965 | 239.0 million |
| ERIC | <u>4.0 million</u> |
| Total | \$484.0 |

The OST staff recognized that this was only a partial figure of the annual expenditures for FY 1968 by the Federal government on libraries. It did not involve the costs of the three national libraries, the costs of agency library operations, and the costs of library and information programs in Federal science, technology and other fields. It further recognized that there was ^{no} strong effort in the Executive Office of the President or elsewhere to analyze these costs in a wholistic or systematic

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Subject: Comments on the Week, 11 March 1968, pp 3.

manner. We did not know if we were spending too little, too much, or just about the right amount. Moreover, we recognized that the system of evaluation of the results of these expenditures was not even/discussed, let alone in place. It was a prevailing view in OST that there was a need for a more analytical approach, more plans, more objectives, more milestones, and more responsible management and stewardship provided at the Executive Office of the President and in Congress. The prevailing "cornucopian" approach, if continued, would result in problems that could be primarily averted with the application of prudence. While the OST-COSATI basic concern/dealt with the information centers and libraries that served Federal science and technology programs, it was recognized that a broader approach was needed in absence of other management mechanisms at the highest levels of government. The perception was that just as the shift from "small" science to "big" science called for greatly improved information programs and management, so did the shift from small library and information program to large library and information activities/support call for similarly improved management and husbandry. Unfortunately, sponsors and managers of library and information programs, especially those who came to depend on annual increases in funds, /indiscriminately provided, were apprehensive about the consequences of overall management and supervision, but above all,/demonstrating the accomplishments achieved by the funding previously provided.

For these reasons, DHEW and OST eagerly awaited the report of the National Advisory Commission on Libraries to provide an objective assessment and/recommendations for future actions by the Federal government in the support of library programs and activities. Because of the illness of its chairman, Doug Knight, who refused to resign during the work of the Commission, Fred Burkhardt, one of the members, took on the task but without the authority of the chairman. The White House was anxious to get the completed report, which might contribute to a legislative initiative for the next budget. What it got was a Summary Report instead. When it did not achieve legislative status, Burkhardt told the White House authorities that he would like to withdraw the Summary Report, so that the final report would be of a higher quality.

In the meantime, the OST staff studied the Summary Report and prepared a background analysis to be used at a meeting between Donald Hornig and Dr. Howe of the Office of Education to determine what support would be given the recommendations of the National Advisory Commission on Libraries. They found that (1) sharp dissention marked the efforts of the NACOL group, dissension involving the chairman, the members, the staff director and the staff; (2) the inevitable result of the differences was a bland, neutral report; (3) an examination of the terms of reference of the commission revealed that the questions to be answered were, in fact, not answered by the Commission in the report; and (4) the summary report lacked the back-up data to support the findings and recommendations. It was agreed that the Summary Report not be sent to the President with the hope that the Final Report would be more substantial. The alternative of sending it forward without comment was rejected, largely because of the recognition that the contents of the report were known to the library community reacting to and forwarding it at large. Failure to take responsible steps in/ could be misconstrued by the library community. In its Summary Report form, it could be used by them to push for financial and organizational expansion without the safeguards sought by authorities in the White House and Congress.² Burkhardt stated his desire to discuss the Summary Report with Doug Cater, White House staff, but OST opted for the completion of the final report as a logical step to take before further action.

As the news spread about the Networks for Knowledge initiative, proposed by President Johnson, the subject was discussed in many fora in the public and private sectors. Director, USIA, One of the spokesmen was Leonard E. Marks, who was quoted after a speech in Pittsburgh as saying that he favored the creation of a world-wide grid for man's accumulated store of information. Such a grid, which the Washington Post called an "infopool," would eventually make possible the ready retrieval and transfer to any point on earth of

¹ Aines, Andrew A., OST. Memoranda to Donald F. Hornig, Director, OST, Subjects Reports of the Week, March 3, 1968 (pp 3) and March 18, 1968 (pp 2)

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man's million-year accumulation of knowledge. He added, "By 1980, the amount of additional information we collect will equal in volume all the data produced in the previous 2000 years."¹ A discussion on the subject of Network for Knowledge with Dr. Charles V. Kidd, OST, and members of the NSF staff: Milton E. Rose, Arthur Melmud, Joan Callanan, and Henry Dubester, resulted in a background paper prepared by Milton E. Rose, Head, NSF Office of Computing Activities.² While the title of the paper places it in the educational field, a reading of the document reveals that there is a full discussion of proposed and ongoing information networks in science and technology. A meeting was arranged with BOB and representatives of NSF, the Office of Education, and the Office of Telecommunications Management. The OST representatives were John Mays and Andrew A. Aines. One reason for the meeting was the lack of coordination of the Office of Education bill which contained a title on networks for knowledge. Although it was early in the game, the possibility of overlap and duplication, also the difficulty of interpretation of roles and missions were seen as problems to be solved. BOB thought it important to get a better rationalization before the Office of Education bill went before Congress. It asked the O/E representatives to prepare such a rationale. Aines recommended, after the meeting, that OST bring together a larger group interested in the concept of Networks for Knowledge. Alternatively, a small group in the National Systems panel might be asked to look at the coordination problem.³ At the time, it was thought that a two-prong effort by OST and COSATI would contribute to the "technical base" that Doug Cater hoped would "take over."

Aines followed up his suggestions on the Networks for Knowledge project with another memorandum to Hornig with further recommendations, hoping to stimulate action. In this memorandum, he advocated the preparation of objectives, work plans, studies, tasks to be undertaken by subgroups and individuals, format for the final report, and a

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director OST, Subject: Comments on the Week, March 3, 1968, pp3.

² Rose, Milton E., National Science Foundation, Background Paper: Networks for Knowledge in Education, March 18, 1968, pp 20.

³ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, OST, Memorandum, Subject:

timetable. He suggested that there be a report on the status of the various assignments given to individuals: survey in the educational field being undertaken by Costin and Hayworth; the negotiations with NET being staged by Costin; and the less fixed task given to Commissioner Lee to look into tariffs. There was a need for staff commitments from the panel members. Also suggested was a more formal program for coordination with the Task Force on Communications Policy and other groups. Yet another recommendation to Hornig was made by Aines, after a discussion with Dave Beckler, OST's Executive Officer, about adding to the momentum that the United States had built up in the field of communications and information-processing by urging OECD and other international groups to join the United States in developing the Networks for Knowledge concept.¹ The virus of Networks for Knowledge growth made inroads at the National Science Foundation; Burt Adkinson, Head of OSIS, revealed that plans were being made for his organization to move into more aspects of networks at the user level. His reference was to local and state level programs. We agreed that there might be a future problem if he moved out more rapidly in the professional society area, since it might call for additional government funding support.²

The same note of caution was expressed in a memorandum to Charles V. Kidd, Executive Secretary of FCST. It was written in response to comments by Hornig after reading a criticism appearing in a report on oceanography prepared by Vahle. Much of the criticism dealt with the lack of planning at the Executive Office of the President level. Wrote Aines:³

I would not argue too strongly against Vahle's view, but we are not equipped to do what he suggests....Even so, COSATI has been concerned with national planning, (but) the need for more staff has resulted in less than the program we would want...It is my belief that in the STI area, getting too far out with elaborate information systems and networks is fraught with danger. Possibly this is true in oceanography. Before we can develop international information networks, we need strong national programs. Before we can have a strong national program, we need good Federal STI programs. Enlargement of the OST staff can help us significantly in preparing all of these plans, but the zeitgeist for national systems has to be right as well. In addition, we have to gear up

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: A Brief Look at the Preceding Week and Observations, March 31, 1968, pp 3.

² Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: The Week in Review, March 23, 1968, pp 3.

³ Aines, Andrew A. OST Memorandum to C W Kidd OST Subject: Vahle's Report on Ocean-

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an even better COSATI operation. We need more interest on the part of the FCST principals, as well as stronger internal agency programs that are better led, better coordinated and better supervised. We need people of higher quality from the agencies than we have been getting to man the panels and task groups. Agencies ought to assist us with more people of quality to work on purely COSATI-type matters. With the help of BOB examiners and others, OST should push harder into the substance of agency STI programs. If we are to make a better impact on planning, we need a full-time executive secretary for the National Systems Task Group. COSATI should be able to command more funds for studies and consultants. Now, we have to beg the agencies for funding help, not the best way to go. Finally, we need to have more non-government representatives on certain panels and task groups.

Perhaps a note of petulance crept into Aines' comments to Kidd, but in light of the considerable number of programs, projects and tasks that were 'being undertaken as by the COSATI officers, often referred to/"juggling a hundred balls simultaneously," it is easy to understand the reaction. It was obviously understood by the Science Advisor to the President who tried hard to get a small increase in staff to help on a number of occasions.

The support of STI program management by Hornig was evident in another minor episode. Aines reported to Hornig about a conflict between the Department of Commerce and NASA.¹ The occasion was a meeting held at the request of Dr. Kincaid of the Department of Commerce, which was attended by representatives of Commerce, NASA, BOB and OST. Dr. Kincaid sought to put pressure on NASA to turn its STI dissemination program over to the Clearinghouse for Federal STI, the course of action that was undertaken by DOD, which turned its unclassified and unlimited technical report dissemination program over to the Clearinhouse earlier. Both sides presented their views and Aines was asked by Kincaid to head a group to investigate the value of a combined operation. Aines declined the invitation, pointing out that the solution would be better if there was a bilateral agreement, that the Chairman of COSATI should be in the position to review any decision made, that the Clearinghouse should, as the initiator of the request, present stronger data to show the merits of such a shift, including giving an account of the gains made in reducing costs, promised when DDC gave dissemination responsi-

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: The Week in Review - NASA Versus Commerce, March 23, 1968, pp 3.

bility to CFSTI, a pact concluded by Carlson (DOD) and Schon (DOC). Aines' report concluded with the comments:

Kincaid and Finger (NASA) agreed to continue discussions on the matter. Schleede of BOB went along with my view generally. I made the point that there would be no success unless each party was ready to communicate and maintained a reasonably open-minded attitude. At the moment, this was not evident.

Dr. Hornig sent a note to Aines on March 29, 1968 stating:¹

With reference to the NASA vs Commerce item in your 23 March 1968 memo, is this really a bilateral matter between them? I thought we had, via the President, made a big fuss designating the Clearinghouse as the single point of issue of unclassified government reports. If so, we have a strong interest in participating and maintaining this position. I don't think we should leave it to the agencies. Will you see me please.

Hornig being on a travel status, Aines sent a memorandum back to him with the following summarized explanation:²

NASA uses a contractor to run its facility; the contract being given on the lowest bid basis. Should NASA end this method by turning its dissemination over to a government agency, this action could draw commercial and congressional censure. Moreover, the NASA facility does additional work for NASA that CFSTI could not now do. When DDC turned its dissemination function over to CFSTI, it retained that part dealing with classified information. Neither NASA nor CFSTI have expressed any desire for this kind of an arrangement. If CFSTI was funded by Congress to disseminate Federal agency STI, I expect that CFSTI would have little difficulty in disseminating their unclassified technical reports, but this is not in the offing. Even now, if CFSTI moves into multi-agency funding, there may be long range problems with Congress. CFSTI has little leverage with NASA, since it has its own legislation to disseminate its STI. CFSTI is being undercut by its own agency, in that not all of the Commerce activities, NBS being one, turn their technical reports over to CFSTI to disseminate. This is well known by the members of COSATI. OST did not participate in the working out of the DOD-Commerce agreement. The agencies wanted to do it - and did. Maladroitly, CFSTI tried to use GAO to force the issue by releasing information about the new arrangement with DOD to be used as a club. The result has been to infuriate NASA. If that was not enough, CFSTI appealed to BOB for help, a ploy fully alienating NASA from Commerce. NASA is not in the mood to do business with CFSTI and it is hard to censure the agency for this attitude. There is something else you should be aware of - NASA provides its formal report series to CFSTI for the latter's sale. In its announcement document - STAR-NASA tells its readers what documents are available in CFSTI and quotes the selling price. NASA makes its documents available at no cost to its contractors, CFSTI wants to take over this function and sell the documents. The point is that NASA really is convinced that it is cooperating with CFSTI and not

¹ Hornig, Donald F., Director, OST, Note to Colonel Aines, March 29, 1968, pp 1.

² Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: NASA and CFSTI, 3 April 1968, pp 2.

challenging the Clearinghouse's authority to distribute government reports to users. Based on the above, I feel that the best action for OST is to bring the parties together to resolve the issue.

Apparently, Hornig accepted the logic, since he did not bring up the matter again. If he had, I would have pointed out to him that there was no sign of the savings that DOD and Commerce claimed would come from their new arrangement. DOD began to pay the Clearinghouse for services rendered - about 1 million dollars a year - but there was no reduction of the Defense Documentation Center budget, nor was there a discernable reduction in DDC personnel. During the discussions with Commerce spokesmen, they were asked to look into Commerce Department's failure to place all of its STI materials into the Clearinghouse for dissemination. This continued to be a problem, unfortunately.

During the discussions of the Networks for Knowledge program, it was inevitable that a discussion of the proliferation of purposeful ongoing and planned information networks take place. Aside from the field of education, what was happening in science and technology? Were the networks "paper-ink" oriented, electronic in nature or did they employ both technologies? For illustrative purposes, a brief list was prepared for the members of the Hornig Networks for Knowledge Panel.¹

Health: National Biomedical Information System National Toxicological System, DHEW-Supported Information Analysis Centers, Poison Control Centers, NLM MEDLARS.

Education: Educational Resources Information System, Inter-university Communications Council, and others

Natural Resources: Water Resources Information System, Environmental Services Information Systems, National Data Program for the Marine Environment, Engineering Data System, Entomology Information Service.

Science and Technology: National Standard Reference Data System, Automation of Primary Publications, Patent Information, AEC's Specialized Information Centers, National Chemical Information System, DOD's Specialized Information Centers, Space Information Systems, Nuclear Energy Information Systems, National Serials Data System, Engineering Data Systems, Radiation Information System, National

¹ Aines, Andrew A., OST, Memorandum for Donald F. Hornig, Director, OST, Subject: Networks for Knowledge, February 18, 1968, pp 2.

Serials Data System, Smithsonian Science Information Exchange, National Referral Center for Science and Technology, Clearinghouse for Federal Scientific and Technical Information, State Technical Services Program, Defense Documentation Center, and many others in and out of the government.

Most of these information systems, especially the smaller ones, were largely, but not exclusively, employing inkprint technology, but there was a rapid shift towards computer-based systems. Some of the early programs were created to get a better grasp on literature control, reacting to the explosion of documents that made up the literature of science and technology. These were joined by scientific and technical data (numerical) centers and networks. Not unexpectedly, two communities - one involved with scientific and technical literature and the other with numerical data - were evolving without interaction or coordination. What was not clear at that time nor currently, since the divisiveness continues, is the risk inherent in this separation. During the 1960s, a divergence of this nature was frowned upon as the focus was on an array of harmonious, compatible STI systems in the public and the private sectors. With the disappearance of the Federal apparatus seeking to integrate public and private STI systems, the issue is receiving precious little attention today. It seems reasonable to assume that without an organization similar to the COSATI National Information Systems task group, backed up by OSTP, the development of plans and programs of this nature becomes impossible.

Growth of Federal agency computer-based information systems for science and technology was very rapid during the 1950s. This caused the COSATI Panel on Operational Techniques and Systems to look into the effectiveness and efficiency of these systems. One of its efforts was commission a contractor to undertake an appraisal of some of them under its guidance. In April 1968, Herner and Company, Washington, D.C., prepared a publication describing thirteen information systems designed primarily for the announcement, storage, retrieval and secondary distribution of scientific and technical information reports.¹

¹ Panel on Operational Techniques and Systems, Committee on Scientific and Technical Information, Federal Council for Science and Technology, Selected Mechanized Technical Information Systems, April 1968, First Edition, Edited by Lynn Ockerman, Anna

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The illustrative thirteen systems covered programs at the Defense Documentation Center, the Highway Research Board (located at the National Research Council), National Aeronautics and Space Administration, National Library of Medicine, Department of Agriculture's Bibliography of Agriculture and the Pesticides Information Center, Clearinghouse for Federal Scientific and Technical Information (Department of Commerce), DHEW's Educational Resources Information Center (ERIC), Department of Interior's Bonneville Power Administration, Bureau of Reclamation, and the Geological Survey, the Patent Office's International Cooperation in Information Retrieval among Examining Patent Offices (ICIREPAR), and the U.S. Air Force's Foreign Technology Division. The Panel hoped that this publication would be followed by listings of other mechanized information systems as they were established, working on the assumption that this and future publications would be of value to designers of new systems and users of the current systems.

There is no record of use of the publication by the designers of new information systems. At least one reason for this was the failure of COSATI to get broad dissemination of the report, although it was well announced within the Federal government. Because of the lack of feedback, no serious attempt was made to provide additional publications of this sort in the future. However, a re-reading of its contents reveals a considerable amount of valuable information, often in fine detail, for systems designers.

During this period, there was increasing concern about the problem of massive data collections which was leading to the related problem of data utilization. A meeting was held on the latter problem at the Office of Science and Technology. The question that was posed at this meeting was - what should be done about assuring use of the vast quantities of data that were being generated in the Federal R&D programs?

¹ Karel, Leonard, OST, Minutes of Meeting on Problem of Data Utilization, April 18, 1968, pp 5.

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The first question addressed dealt with the size of data collections. Dr. James Vette, Director of the the National Space Data Center, located at Goddard Space Flight Center, stated that 200,000 magnetic tapes were stored in his facility and he was gathering the equivalent of 5,000 tapes each week. The daily accumulation was between 200 to 300 billion bits, and the prediction was that this amount would expand to 700 billion per day in the foreseeable future. Dr. Woodrow Jacobs, ESSA, said that he had 18,000 reels of completed tape, chiefly medical, plus 11,100 reels of photographic tapes. Dr. James Churgin of the Navy Oceanographic Data Center said his holdings were small compared to his associates, but this was temporary since NODC was slated for a large expansion of data. The DOD representative, Walter C. Christensen pointed out that his agency was spending about \$2.5 billion annually for engineering data that only had a half-life of five years. The total DOD investment was in the order of \$10 billion and encompassed 115 widely diverse, individual computerized systems each handling large amounts of data. Dr. Edward L. Brady, National Bureau of Standards, spoke of the National Standard Reference Data program and the 30 centers comprising the program. Allen Sprow of the Veterans Administration pointed out that VA had about 26 million clients and patient data holdings were huge. Dr. William Thurston, Department of Interior, discussed stream flow and geological data, also water quality and oil and gas production. In some cases, the older the records, the more valuable the data, especially when geopolitical, political, and economic factors became involved. Dr. Ruth Davis, National Library of Medicine, talked about DHEW and the health area. Although there was a lack of organized, addressable records in DHEW, there were large amounts of clinical and other records in hospital and private hands, but the data problem on the welfare side of DHEW was formidable. Social Security data was prodigious, also data resulting from the Medicare and Medicaid programs. She talked about the installation costs of an on-line automated communication system with a console in every doctor's office, every hospital, and every clinic, then being discussed as a future project. Dr. Frederic R. Theriault, National Security Agency, commented on the tremendous data collections in agencies concerned with foreign and domestic as-

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pects of national security. Colonel Andrew A. Aines reminded the attendees that other agencies had large holdings, such as Bureau of Census, Department of Agriculture, and other agencies that generated Federal statistics.

A pause in relating what went on at the meeting is in order here to point out the obvious - the growth of numeric data since 1968 has been immense in the Federal government, even if there may have been inroads attributable to the implementation of Federal paper control legislation in the last few years.

Returning to the meeting, Dr. Vette discussed the economic merits of purging, retiring, archiving data. NASA's policy in 1968 called for preservation rather than purging or archiving, but this could only be considered a short-time solution. Dr. Jacobs discussed the problem of redundancy in the ESSA files, also the importance of time series in which new, valuable bits of information may appear among largely redundant records. Dr. John M. Richardson, Department of Commerce, called attention to the value of old astrophysics data in verifying later theories. Dr. Brady offered the view that a basic premise of NBS assumed that many data lack value and can be replaced. Much of the Standard Reference Data program lies in condensation of data to make them more manageable and usable. Dr. William Molo, NODC, asserted that with the advent of automated devices for obtaining oceanographic data, NODC would face the same problems as now face NASA and ESSA. It was agreed that before large amounts of data are collected, there should be a realistic effort to determine the market for such data and the conditions for terminating the gathering of data. Unfortunately, this need was not receiving the attention of those who fund R&D projects. Richardson saw the problem of data use differently. Professionally more credit accrues to those generating and developing their own data than to those who synthesize from data developed by others. It was also agreed that while each agency had to tackle its own problems, there was wisdom in directing the attention of top management to the myriad of problems stemming from accumulating large amounts of data. This should be a general or community effort.

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For several years, National Archives has recognized the extent of the problem and set up a machine-readable information program, but this effort is focused largely on machine-readable files, rather than mega-data resulting from Federal R&D and Federal statistical programs. But with the exception of the National Archives project, little has been done to solve the problem of data explosion and data use over the years, except what is being done on an individual agency basis. Ostensibly, this is an area that needs the attention of the Office of Science and Technology Policy.

It was during this period that the almost single-handed efforts of Dr. Chalmers W. Sherwin to improve the interchange of scientific and technical information in machine language began to end on a note of disappointment. At the PSAC meeting on scientific and technical communication,¹ Sherwin stated:

If one examines the PSAC and OST reports in the area of STI written over the past decade, one finds that the earlier ones (Baker, 1958, Crawford, 1962, and Weinberg, 1963) were not centrally concerned with standardization needed to assure the efficient interchange of bibliographic data between mechanized data files, mainly because the development of such files was just getting started. In 1965, however the Licklider report clearly recognized the need for standardization and efficient convertibility of machine-readable bibliographic records, as did the Systems Development Corporation study of 1966. By mid-1967 it became apparent that a large scale development or expansion of new or modified bibliographic data files systems was about to occur (such as: Library of Congress MARC II, International Nuclear Information System, MEDLARS, Chemical Abstracts, AIP, etc.), and that there is existed no assured mode of efficient interchange - that is, the machine programmed conversion of bibliographic items of information - between these systems. Thus, in October 1967, Dr. Hornig asked me to chair an ad hoc Task Force to examine the problem of the "Interchange of Scientific and Technical Information in Machine Language" (ISTIM). Seven Federal members and seven non-Federal members (the latter being provided under the auspices of SATCOM) comprise this Task Force. The draft of our final report is currently out for criticism to some 130 "Information Advisors" who are involved in the processing of machine-readable bibliographic records.

What we found was that almost every tool needed to provide a precise interface for the exchange of bibliographic records between data files either existed, or was being worked on, one way or another, by various Federal and private organizations concerned with standards. We found that...a number of the data systems were being forced to make unilateral decisions on matters for which standardization agreements were not yet adequately advanced. Needed was an over-all look at the prob-

¹ Sherwin, Chalmers W., OST, The Interchange of Scientific and Technical Infomration in Machine Language, February 20, 1968, pp 9.

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lem to see if the existing or planned parts were adequate, if they all fitted together, and if they would be available on a time scale appropriate to the rapid development of operating systems. Our report identifies the needed components -- such as, coded character sets, tapes, common machine-readable codes (representing, for example, organizational entities, serial titles, etc.) message format structures - and recommends improved means to assure their further and timely development. We avoided the semantically thorny problem of standardization of thesauri, indexing, and classification schemes and concentrated rather on the more tractable matter of the interchange of the data itself.

The members of PSAC listened to the presentation politely and that was about as far as their reaction went. In a meeting with Aines, Sherwin stated that his final report would be delivered to OST on March 1, 1968, if his panel agreed that it was ready for release. If OST accepted the report, he planned to submit it to a wide audience for review and comment, but he agreed that to make it go, it would have to be accepted by the major Federal R&D agencies and some key groups in the private sector, presumably the two national academies. Sherwin held his final meeting on March 1, 1968, and this is how Aines reported it to Hornig:²

Sherwin held ~~had~~ what he hoped was his last meeting with his Panel. A few of the task group members felt that the recommendations being made were insufficient. Sherwin stated that he hoped that no additional meetings will be required and thanked the members for their participation. He (also) stated that he had made a full turn in his thinking that prompted him to form the panel. Progress in this field was going to be slow, thus no attempt should be made to look for standardization; the search should be for convertibility.

Of course, the group on his panel fighting for standards, the Library of Congress MARK II developers being the most outspoken, disagreed with this apostasy. In effect, the Sherwin effort had ground to a halt, even though the need for standardization continued. Obtaining consensus, ^{Sherwin} he found, required too much effort, especially when he had few allies to assist him, allies with the same sense of mission that consumed him. Where he failed, the Library of Congress MARK II group, headed by Henriette Avram, succeeded in its quest. But it should be pointed out that the venerable Library

¹ Aines Andrew A.OST, Memorandum to Donald F. Hornig, Director OST, Subject: Weekly Journal and Flashes, Hot and Cold, 23 February 1968, pp 5.

² Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: A Few Comments on the Week, 3 March 1968, pp 3.

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of Congress had an established image that made its crusade somewhat easier to accomplish. In his cover letter submitting the report to Dr. Hornig, Director of OST, Sherwin wrote:¹

Although we did not obtain all of the objectives you outlined for us, we did agree on several very important matters and also on means to carry on the work under more permanent auspices.

He pointed out that the Federal agencies already had authority to commit their agencies to the implementation of the ISTIM recommendations. He added that the agencies were already active participants in the new USASI Z-39 committee, which should be the focus for a continuing effort. In the concluding section of the ISTIM report (dated April 5, 1968), entitled "What of the Future?", the Panel wrote:

The group was not able to select a standard format structure from several candidates, but deferred to USASI Committee Z-39 for further development and selection.(T)here was not enough time to define a minimal set of common data elements....(I)nideal the attainment of substantial agreement between the various existing and contemplated networks appears difficult....The problem of the efficient machine conversion of common information between diverse data files and specialized networks is not adequately solved. Failure to achieve all objectives occurred not because the problems were insoluble, but because their proper solution requires more time and more technical effort.

After a personal review of the ISTIM report, Aines wrote to Hornig:²

It is a disappointing report (without) substantial recommendations. The tone and the findings are bland; the report is overly tame, lacks challenge and bite. It shied away from recommending any centralized efforts, such as a registration/information center, and largely advocates that every group involved go it alone. There is no assurance that the Z-39 members will come to a rapid agreement leading to new standards....

While Dr. Hornig and Aines were saddened at the turn of events, they still felt that Sherwin was on the right track in perceiving the positive results that would come from the adoption of a standard facilitating the information flow among agencies. Not only was the timing wrong to accomplish his goal, but it was evident that any effort to accelerate the flow of technical information and information about the status of R&D projects would have detractors and resisters within the Federal

¹ Sherwin, Chalmers W, OST, Letter to Donald F. Hornig, Director, OST, Cover letter to the final report of the Task Group for the Interchange of STI in Machine Language (ISTIM), April 5, 1968, pp 2.

² Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: ISTIM Report. May 7, 1968. pp 3.

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R&D community. This adversarial position would continue until the present. The reasons for this obstinacy are rooted in the psychology of the scientist and an unwillingness to share information with outsiders. Even a disciplined R&D community within the Department of Defense is/relinquish to interchange information/required by fiat. This is a subject worth studying on its own, but it is fair to state that the concept underlying the process remains at odds with others more popular/shared by individual researcher's and R&D managers.

This became evident in a meeting initiated by Dr. Donald F. Hornig with several agency R&D and STI managers.¹ In his opening comments, Hornig said:

I consider the work that we did under the leadership of Dr. Sherwin and accepted in principle by the Federal Council for Science and Technology... as an important first step in accomplishing better information exchange. We have a long way to go to get the progress that we desire and I have authorized a new study to be done by a contractor to develop recommendations for new actions to be considered by the Federal Council. Unfortunately, we will not have this study completed until the end of 1968. It is my desire to get the project information sharing program started without equivocation. Not only are work units to be provided, I would like to include technical development plans for larger developmental projects included. These data should be submitted to DDC and other agency information centers within 15 days of their initiation. I am told that within DOD only 50 percent of the 6.1 and 6.2 projects are being reported. The figure should be at least 90 percent.

Each of the agencies were given the opportunity to describe their programs and their intent to make improvements. It became evident that there was a lack of uniformity, as between DOD and NASA, of what was to be reported by the bench workers in laboratories, Federal and contractor. Another problem cited was the requirement to include both descriptive and funding information. Agencies found that the latter requirement was often difficult to fill, because of fluctuations in funding provided with the passage of time. They found that the present system was of marginal use to their researchers and managers. Only NIH found the SSIE program viable and useful. Dr. Hornig listened to what the agency representatives said and afterwards indicated

the need for genuine progress, a belief that OST shared with Congress.

¹ Aines, Andrew A., OST, Memorandum for Dr. Donald F. Hornig, Director, OST, Subject: Agenda and Comments (On research project-reporting developments), April 3, 1968, pp 4. (Meeting notes prepared by A.A.Aines were attached.)

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About a month later, the best of the proposals for the Federal research project-reporting study, one prepared and submitted by Peat, Marwick and Livingston, Inc., was made available to Glenn R. Schleede and Robert Howard, both of the Bureau of the Budget, for their advice. Schleede responded for BOB.¹ He made a number of very useful points. Some of these included: The scope of work still remains vague; this should be worked out before the contractor started to work. The contractor should not be called on to design a complete, idealized system, but to concentrate on practical next steps. The problem of costs versus benefits is bothersome. Will the users embrace the system to make it cost effective? Can the costs of the contract be scaled-down by using in-house resources and channels, collecting some of the needed data through existing channels, and reducing what appears to be high staff time in Phase I of the study? Schleede also volunteered to have BOB observers join Aines in monitoring the study as it was undertaken. OST felt that the Schleede suggestions were useful and therefore to be considered.

During the era of the 1960s, the Federal STI managers maintained responsibility for technology transfer programs for the most part. For this reason, Senator Jennings Randolph, chairman of the Subcommittee on Science and Technology, Select Committee on Small Business, U.S. Senate, interacted with the OST information staff on these programs. Sometime after the interaction, Senator Randolph issued a report of his subcommittee, The Prospects for Technology Transfer, on May 1, 1968. the Subcommittee called on COSATI to:²

Lead all existing information analysis centers toward a network linked by common language and compatible electronic data processing techniques. The centers, and others to be established, should include and stress technology transfer as a function. The evaluation and compaction of raw information into interpreted, readily available packages should be performed to uniform, high-quality standards.

He also asked the agencies to:

¹ Schleede, Glenn R, OMB Office on Economics, Science and Technology, Memorandum to Colonel Andrew A. Aines, OST, Subject: Proposed Contract Study of Federal R&D Project Reporting Systems, May 24, 1968, pp 4.

² Aines, Andrew A, OST, Memorandum to Dr. Donald Hornig, Subject: A Review of the Week dated May 11 1968. nn 3.

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Include a new technology-reporting clause in contracts; assure that intramural laboratories follow a proper identification and reporting procedure; separate technology from a security classification context so that it may be furnished to all potential users; and audit research results for possible use outside of the primary mission.

Not much was accomplished in encouraging the Federal agencies to accelerate their technology transfer programs. The first problem was the difficulty of convincing most agencies that their missions embraced a more vigorous effort in technology transfer. The major exception was NASA, where Richard Lesher, Melvin Day and others involved in STI and technology transfer, were more vigorous in their efforts, stimulated to some degree with the need to encourage Congress to provide funds for NASA. The second problem had to do with their mission statements and enabling legislation. If no specific statements dealing with technology transfer were on the books, they were reluctant to spend funds and other resources. This attitude shifted during the late 1960s and recognition was given to the need by DOD and other agencies. The Small Business agency was, as expected, very vigorous in this area, but lacked the technical ability needed to exploit the technical knowledge generated by Federal R&D funds. For a couple of years there was some acceleration in action as a result of the Department of Commerce State Technical Service/matching program with the States. This program, too, failed to make the grade, despite early promise. It was eliminated unmourned by the Commerce Department and the other Federal agencies. The States, which had built up some fairly elaborate programs, were angry about the lack of dependability of the Federal government, and made no bones about their feelings. The matter of technology transfer did not receive an overwhelming amount of FCST concern during the 1960s, despite the encouragement of Senator Randolph and his subcommittee. This attitude was viewed by the OST STI staff as short-sighted, a view which was vindicated in the years to come.

That OST and COSATI were the focal points for international STI efforts there was no doubt. Not only did COSATI have a Panel on International Information Activities, OST provided a representative to the OECD Information Policy Committee, and designated the individual who would represent the U.S.A. in OECD Computer Utilization Committee.

meetings. William T. Knox and Andrew A. Aines attended the Information Policy Committee for a number of years.

The years of involvement were found to be valuable because; we were able to provide some direction to the OECD programs; got to know our opposite numbers from other countries; and were kept abreast of information developments in the other 23 OECD countries, including Japan. There were many discussions with the representatives of other countries that went on in the corridors of OECD and UNESCO, both being located in Paris.

One of these meetings comes to mind, involving Dr. Rudolph Bree, who was the Director of the Euratom information program, who was, at the time, in process of taking over as the Director of the STI programs of the Common Market. It should be pointed out that the Common Market was, probably still is, beset with intense, internal political problems. In a memorandum to Hornig, Aines gave the gist of a recent conversation with Dr. Bree,¹

Bree was quite candid: OECD is dominated by the United Kingdom and will never amount to anything, unless new directors from countries other than U.K. are elected (the reference was to Alexander King and Peter Judge, both on the OECD staff, two very able international servants); the United States is not particularly trusted in the international sphere because it never maintains a sustained position, European countries simply do not understand the idealistic streak that permeates U.S. thinking; and the Common Market nationals can be expected to maintain something of a common front which we in the science and technology business ought to recognize.

Bree also included Dr. Harry Hookway, who later became the Director of the British Library, but who was at the time of the statement, the chairman of the Information Policy Group of OECD. Bree's comments stimulated another memorandum to Hornig. Aines wrote:²

While Bree may be right to be sensitive about it from the standpoint of the Common Market people, Burt Adkinson and I do not have any knowledge of a cabal that would indicate the need for a change. Bree did not produce any evidence of any kind other than his stated belief that more progress would result if somehow there was a change in principals.

¹ Aines Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Activities Report, May 18, 1968, pp 3.

2. Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, no subject, dated 30 May 1968, one page.

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Another meeting was held with the Dutch science advisor, Boettcher, who took it on himself to talk to Dr. Hornig and Andrew Aines about the problem that Excerpta Medica was claiming it had with the National Library of Medicine. The gist of his argument was that NLM was selling its database services at a price that reduced the sales of the Dutch health information service. Although Aines did not feel that Boettcher's intervention was in good taste, Dr. Hornig felt that his scientific colleague deserved utmost consideration in his complaint. After the discussion with Boettcher, Aines discussed the meeting with Dr. Martin Cummings, Director of NLM, who delivered himself of an earful. He pointed out that:¹

In the last few years, DHEW has supported Excerpta Medica to the tune of about \$1 million. This has been cut back to \$250,000 being provided by the National Institutes of Health. For reasons dealing with economy (and perhaps competition), Cummings suggested to Shannon (NIH Director) that all support be stopped.

As an abstracting service, EM is not competitive with NLM which engages itself only in indexing. EM competes with Garfield's Institute of Science Information, and American commercial service.

Cummings, who was not approached by Boettcher, told EM that he was going to curtail its support in about six months. (He believes that funding a foreign commercial service was dangerous, in light of ISI's involvement as a competitor).

The supporters of EM are trying to shoot down NLM's cooperation with OECE. If EM's services were worthwhile, it should be able to sustain itself.

There was a vague feeling on Aines' part that Dr. Hornig would have liked to give Boettcher a more favorable answer, but that it made no sense to do so. What the event disclosed was the unusual generosity of the Federal government to a foreign publication, which did not take warmly to the drying up of the subsidy it was getting. The issue was to re-appear in the years to come.

The FCST policy document on the foreign dissemination of scientific and technical information by the agencies of the U.S. Federal Government began to get attention in other countries. One example was a request from the Belgian Government official

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Activities Report, 18 May 1968, pp 3.

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responsible for that country's scientific and technical information program.¹ Cockx, who was known to OST as the Belgian representative to the OECD Information Policy Committee. Apparently, Cockx had received a copy of the FCST policy paper on dissemination from Belgian's diplomatic mission in Washington D.C. Cockx' quest was for more information and documents on the subject. He was told that additional information was not available, but an article in a U.S. scientific journal might be helpful.² Excerpts from the article are as follows:

A ten-point policy statement embodying the U.S. Government's position on the dissemination to foreign countries by federal agencies of scientific and technical information was approved by FCST. The new policy constitutes a manifesto by the U.S. that STI is a global resource that should be made widely available, and that the U.S. stands ready to exchange knowledge as widely as possible, even including mainland China, with no strings attached. The policy applies to all agencies and departments of the U.S. government and their contractors, but excludes individuals engaged in personal exchanges. It applies to unclassified, unlimited, non-proprietary information covering natural, social and information sciences available to the U.S. public.

Two objectives for the policy were to establish international information systems through which the worldwide scientific and technical literature will flow routinely into the U.S., and to influence and encourage the establishment of standards so that foreign information systems and those of the U.S. will be compatible. This is vital, Aines points out, if science and technology are to avoid an era of computerized information in which a babel of incompatible systems is superimposed on our present-day babel of languages.

Some of the information scientists working in international organizations, like the International Congress of Scientific Unions and UNESCO, were encouraged that at least one of the leading industrialized countries had unilaterally issued a policy document advocating wide and relatively open dissemination of STI. Interestingly, no other country issued a similar manifesto during the intervening years. In a way, this failure was something of a manifesto, also, that in net effect has caused the U.S. to take a much more restrictive view about the dissemination of "technical know-how" in the mid 1970s. In the long pull, the United States will find it advanta-

¹ Cockx, A, Director, Centre National De Documentation Scientifique Et Technique, Brussels, Belgium, April 29, 1968, 1 page.

² Author unknown, U.S. Ready for Worldwide Exchange of Scientific, Technical Information, Scientific Research (U.S.A.), April 15, 1968, page 15.

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geous to return to the position advocated in the FCST policy statement, which does no violence to the protection of vital security and high technology technical information. This intent will (1) reassert our longtime open dissemination policy; (2) come to terms with the impracticality of operating an impermeable information system because of our political system; and (3) reassert the kind of leadership in information matters that was in evidence during the 1960s.

COSATI kept turning out new products during the Spring 1968 period. One was a bibliography of 120 references in the literature dealing with technology transfer. The document included an index for easy searching.¹ A subpanel was formed to study agency user charges, largely because they had a crazy-quilt set of policies on user charges. The report to Hornig stated: "We are looking into the jumble to see if we can find a more simple and generalized approach. It will not be easy."² It was during this period that President Lyndon Johnson decreed a reduction of Federal government costs campaign. In the weekly summary to Hornig, Aines wrote:³

It is no easier for those of us in the sci-com area to write a decalogue for people facing budget cuts than in any other area. As a service function, we have to face the expectation that cuts are inevitable. As an R&D field, the same is true. There is one truism that should be considered by all R&D managers and project leaders, however. In a number of areas, by virtue of efficient information retrieval systems, it is possible to fill some blocks in the (overall) mosaic by depending on research work done by others. In times of affluence, you need good information programs; in times of need, you can only survive if you have outstanding information retrieval systems. Granted that there may be some oversimplification in this observation, but there is enough of a germ of truth to make it a useful rule of thumb.

Strangely, the notion of much better gathering of the world's STI as a way to relieve some of the difficulties that arise when Federal R&D dollars become scarce never seemed to catch on in the Federal government, but the value of such an initiative was the underlying philosophy of most of the countries in the world. It still is Japan and the Soviet Union are examples of successful harvesting, but there are

¹ Aines, Andrew A., OST, Memorandum for Donald F. Hornig, Director, OST, Subject: Weekly Summary and Views, May 25, 1968., pp 3.

² Ibid, page 2.

³ Ibid, page 1.

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others feeling and acting the same way. Paradoxically, before the United States began its large publicly-supported R&D programs, the scientists of that era borrowed heavily from the knowledge banks of Western Europe. During the period of affluence, something of a sociology came in vogue that reversed the philosophies of the/ scientists and engineers - the fruits of their R&D were precious and of much more valuable than new knowledge produced elsewhere. Of course, there were a few exceptions to the stuff chauvinism that prevailed.

In the same weekly report to the Director, OST, there is an item about a meeting with Dr. James Singleton of Systems Development Corporation to discuss the Marine Data Study it was undertaking for Dr. Edward Wenk/^{pre-World War II} At the time that this was being done, SDC was considering leaving the not-for-profit world to become a profit-seeking organization. Singleton addressed this subject, admitting that SDC was contemplating a non-profit trust to administer an active contracting operation. In my note to Hornig, I wrote:¹

I suggested to SDC that it might want to consider as it proceeds in its study that the community to be served by its product is not quite the same as the one that exists today. In five or ten years, the use of the computer will be much more acceptable to the younger people who are beginning to come out of the colleges and technical institutes. I also argued that population (and other) pressures will make farming of the oceans, as an example, more of a requirement.

Ultimately, SDC moved into commercial operations and aquaculture continued to grow and prosper. The growth of computer users during the intervening years has been an extraordinary and predictable phenomenon.

COSATI undertook yet another interesting effort during this period. Vast amounts of data were being telemetered from space, the oceans and the environment, but little attention was being given to the explosion of these data from a management and coordination standpoint. NASA, for example, had accumulated 300,000 magnetic tapes at the Goddard Space Center in Maryland. The scientist responsible for this program, Dr. James Vette, was asked to chair a small COSATI ad hoc task group to explore the extent of the problem and make recommendations leading to some solutions.

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Interestingly, it was evident that the COSATI members, who were dealing largely with improving document-handling, had little real interest in data programs. Their lack of identification with data programs was considered by the OST and COSATI information leadership as counterproductive and divisive. The problem was exacerbated by the similar lack of interest of R&D managers in this new development. Stemming from the initial work of Vette, was the determination of COSATI to undertake a more formal study of data programs and systems as part of the National Systems Information Program for Science and Technology.

During 1968, more concern was being shown for information program costs and benefits with the OST-COSATI front office. Up to this point, actions were being taken through NSF and COSATI to get a "handle" on the costs of Federal STI programs, and considerable progress was registered in obtaining "ball park" statistics. What was unavailable, however, were information and data about the "benefits" of the proliferating STI programs. Dr. Leonard Karrel, who was loaned to OST by NLM,¹ was asked to make an informal study whose purposes were:

To provide a companion-piece, although not matching, of the study on costs being put together.

To give the Federal agencies an opportunity to "showcase" their gains.

To get the agencies more used to the idea of applying PPB principles to the information systems area and to develop a procedure for obtaining the data.

To provide an input to the 1968 COSATI Progress Report.

Karel was asked to obtain the data by means of an informal survey of the key COSATI and FCST members and observers. This was a difficult and unrewarding effort, largely because many of the Federal R&D managers failed to give their STI managers authority to gather all of the management data that were needed to operate an agency-wide information system. Statistics from various agency sources had to be

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Activities Report, May 18, 1968, pp 3.

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"pieced" together from different agency sources to get a complete picture of costs and benefits. OST had discussed with BOB the necessity for STI budget line items but nothing was done by BOB to make this possible. In most agencies, research library accounts were kept separately, as were information R&D, "page charge", technology transfer, publication, information acquisition, information-handling costs of bench scientists and others. At the time this chapter is being written, even with the involvement of OMB's Office of Information and Regulatory Affairs in information resource management, little is being done to enhance agency STI management with required cost/benefit statistics. The General Accounting Office had established an R&D group during this period that stated that it would give particular emphasis to technical information activities. One of the GAO studies involved the DOD research work unit manggement information system from a cost/benefit point of view.¹ In a discussion with Aines, the head of the GAO team explained that it was also reviewing the CFSTI and NASA operations and that "it was less interested in bookkeeping than in the management practices of Federal R&D , inexperienced but agreed that it was relatively in the STI and R&D management areas and that much homework would be needed before it would seek to make an impact." It may be a harsh comment, but many years have passed since this conversation took place, a number of Federal STI studies were undertaken by various GAO teams in the meantime, but GAO has not yet learned enough about R&D and STI affairs to make respected evaluations that the Federal agencies would accept and implement. There is more to be learned about the successes and failures of Federal STI programs in the reports of the Congressional Research Service than in GAO reports.

For several years, OST officials involved in STI were concerned with the lack of internal STI coordination in the Department of Commerce. The problem was the lack of a full time STI manager and coordinator at the headquarters level, knowledgeable

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Weekly Summary and Views, May 25, 1968, pp 3.

about the agency-wide program, or a lack of support by the Commerce headquarters of any person who was designated to represent DOC in COSATI. One of the episodes that ~~irked~~ was DOC's failure to force the National Bureau of Standards to disseminate its reports through the Commerce Department's Clearinghouse for Scientific and Technical Information, even though DOC was using COSATI to get other Federal agencies to include all of their unclassified STI studies and reports in submissions to CFSTI. On this occasion, a meeting was held that included Philip Reilly, Director of DOC's State Technical Services, Kushner of NBS, and Kincaid, DOC Headquarters, to discuss a contract~~that~~ State Technical Services wanted to give the Library of Congress' National Referral Center, which was no longer being funded by NSF to compile a list of research centers for the Office of State Technical Services. OST agreed that the National Referral Center was a good choice to get the \$75,000 job done, but there was some question about not using the DOC's Clearinghouse, which needed revenue badly, to do the job. It was found that Reilly had approached the Library of Congress directory without discussing the matter with Sautter (Clearinghouse), Kushner of NBS, and Kincaid. Aines wrote about this case:¹

Reilly has decided to consummate the deal with the Library of Congress because he thinks that it can do a better job than CFSTI. He may be right, but I think his agency ought to take steps to run a tighter ship.

The memorandum to Hornig said about the CFSTI, "Their (DOC) baby is suffering somewhat from dollar malnutrition."

Dimly at first, there was some feeling that agency mission-based information systems were not developing as rapidly as they should be. One reason for the problem was the lack of focal point arrangements within agency headquarters with the knowledge and experience in information and agency functional matters to raise the level and quality of information operations as they related to agency mission accomplishment.

Another reason stemmed from the lack of individuals and groups within the Executive

¹ Aines, Andrew A., OST, Memorandum for Dr. Donald F. Hornig, Director, OST, subject; A Review of the Week, May 11, 1968, pp 3.

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Office of the President with enough knowledge and authority to encourage agencies to organize themselves better for more sophisticated information use. A third reason was the lack of an overall information system within agencies that quickly and efficiently transferred information of importance to all affected components..

The absence of key individuals and integrative information programs meant that the solution of difficult agency problems and issues would be slower and less effective.

With the passage of time, we began to talk about the need for information systems for decision-making, problem-solving and crises management as a higher information management need for agencies. Occasionally, incidents would occur that underscored the need for improved information systems and information husbandry. One of these incidents involved riot control in Washington, D.C. Under the heading of an item labeled "Information Gap Hindered Riot Control," Aines wrote to Hornig: ¹

This was the title of a Washington Post article on 2 May 1968 written by Kaiser and Bernstein. The Deputy Mayor, T.W. Fletcher admitted that "the great problem" hampered the city's response to the first three days of rioting last month." and that "there was a serious breakdown in communications among district government agencies." He explained that there was inadequate telephone service, vague chains of command, lack of a central communications facility, etc." Presumably, steps are being taken to rectify the problem, which is outside of our direct line of action. Nevertheless, Don, I suggest that one of the pregnant fields we could get into - and perhaps do some good - deals with the employment of modern communications and information-processing technology to solve socio-political-economic problems. For a starter, we could form an ad hoc group - even a one day affair - just to explore the value of such a probe. We could invite people from industry, government agencies, and from universities and brain tanks interested in such a program.

Hornig suggested in a penciled note on the mem.orandum, "Compare notes with W.B. (Walter Baer)." This was mentioned to Baer subsequently, but it is not known if he took any steps to push the concept. The OST and COSATI workload in the STI area was sufficiently great as to preclude any independent action on Aines' part, but the need for more responsive information systems became a continuing matter for concern with the passage of time. It arose a few months later in a discussion with George

¹ Aines, Andrew A, OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: A Review of the Week, May 11, 1968, pp 3.

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Belser, an information expert at Battelle Memorial Institute, Columbus, Ohio.

Belser described a new operation at Battelle, the Physical Security Information Analysis Center. It was formed as a result of the U.S. Riot Commission Report (p.490). This report stated:¹

"in order to help law enforcement agencies improve their knowledge and strengthen their capabilities to prevent and control civil disorders, a national center and clearinghouse should be established to develop, evaluate, and disseminate riot prevention and control data and information."

Battelle read the report and then organized the center using its own resources. It is adding to a growing data base on control and dispersal of civil disturbances. It has accumulated several hundred documents in such fields as: non-lethal weaponry, chemical and biological systems, sonic and electronic systems, light and electrical systems, incapacitating systems and techniques, mob and riot control, psychology of civil disturbances and tactical operations.

...I think it is mandatory that our Federal agencies begin to understand such needs and move more rapidly. It was months ago that I talked to people in the Department of Justice about the need of action, and perhaps this is happening in the sphere of operations....

There was no response from Dr. Hornig on this note. How long Battelle kept its information center in operation, and how well it was used is not known. The disappearance of riots in U.S. cities with the passage of time reduced the need for an information analysis center on the subject, probably. It was almost a certainty that cities and states improved their operations in this area. The Federal Emergency Management Agency has engaged in considerable planning in "emergency" areas and has been an advocate of much improved information and communications systems. Experiences such as the civil disturbance episodes reinforced the view that modern information systems were needed to deal with crises and that they should be in place for quick reaction. Moreover, these systems would be effective only if they were integrated and immediately "tappable" by those with direct responsibility in time of need.

In the same memorandum, there was an expression of concern that members of the Federal Council for Science and Technology were insufficiently knowledgeable about the actual

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Views and Reviews, a description of the new center, June 2, 1968, pp 3.

work going on within their agencies. The direct reference was focused on information activities, but it probably applied to other areas as well. The concern was stimulated by congressional criticism that COSATI should have more power to achieve progress / Study IV, Select (Elliott) Committee reported elsewhere in this book.

It was also precipitated by the lack of close contact between the Federal R&D heads, who were members of FCST, and the agency STI managers, who were the members of COSATI. Another indictment of the way FCST was operating and this had nothing to do with the way FCST was chaired by Hornig - was the tendency of FCST members to send assistants- and not always their deputies - to attend FCST meetings.

One of the high points of the crusade to improve Federal STI programs was the involvement of Dr. William O. Baker over the years. Bill Baker was the President of the Bell Telephone Laboratories, now emeritus of that institution. He also was chairman of the PAC panel that prepared the report: Improving the Availability of STI in the United States (7 December 1958) and a staunch friend and at one time, a fellow Commissioner on the U.S. National Commission for Libraries and Information Science. In a letter, Baker wrote:

...There is a high appreciation of this phase (STI) of our Federal scientific endeavors, more widespread through the national community than I believe any other single program commands. Hence, it is all the more appropriate that elements of COSATI ponder the current situation and move forward expectantly and confidently to an even more successful future...I have a keen interest in what happens to the "networks for knowledge" concept, for which COSATI's activities seem to me to represent the only realism. Indeed, along the paths already outlined by COSATI and its affiliates, an actionable network is evolving which could yield exceedingly useful patterns for broader fields of knowledge dissemination with electrical aids. By contrast, the foreordained failure of the "knowledge network" experiments of the New York State Library System, through the abortive use of facsimile (which, as you have probably noted, was somehow manipulated to take even longer than the mails!) is a sobering example of what could happen to knowledge networks in general if appropriate feasibility and operations are underdeveloped...

¹ Baker, William O., Bell Telephone Laboratories, letter to Andrew A. Aines, Chairman of COSATI, FCST, June 4, 1968, pp 2.

It was always amazing how the busy Dr. Baker could compartment his attention to cover the vast operations of the Bell Laboratories, participate in many public service programs, PSAC being only one, and maintain correspondence with an army of scientific and governmental colleagues. His support of COSATI was particularly gratifying over the years. His reference to networks for knowledge focused more directly on the national information systems for science and technology than the abortive White House brief flirtation with Networks for Knowledge that President Johnson which is initiated and reported on in another section of this book. His interest in the field is further underscored by another passage in his letter. He wrote:

You may have noted the relatively recent publications of my associates Brown, Pierce and Traub on ideas of how scientific journals can be replaced or augmented. My colleague, Dr. W.S. Brown, has also designed a circulation system for scientific papers based on mechanization of reader interest.

As chairman of COSATI, Aines found it very desirable to keep the OST director and staff apprised of what was going on in the science communications field, especially the contributions of OST and COSATI. To this end, he prepared a "highlights" paper, which is summarized as follows:¹

Steps were taken to develop a sensitive, interactive Federal agency STI network under the guidance of OST and FCST. Through this mechanism, some 25 Federal agencies carry on coordinated programs designed to improve intra- and inter-agency interchange of STI. Actions were taken and studies performed to lay out a national bio-medical and toxicological information system under the leadership of the National Library of Medicine. Recommendations have been made to structure a number of STI networks, which would be an important pillar for the President's proposal for Networks of Knowledge. A number of programs have been undertaken to develop a number of standards and conventions to improve the exchange of knowledge. OST and COSATI have participated in a number of actions to encourage and support the use of new information technology and develop substantive information systems that will operate at Federal, national and international settings. In 1966, a Task Force study was submitted to the White House, recommending Presidential initiatives to strengthen agency programs and identify the President as the first President to encourage the development of a national STI system employing the new technology.

-¹ Aines Andrew A., OST, title: Highlights of Significant Events and Actions Taken in the Scientific and Technical Information Field, June 5, 1968, pp 2.

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The future of the United States depends on leadership in science and technology. A product of the large Federal R&D programs is critical data. To advance the critical data program, the National Standard Reference Data Program was established at the National Bureau of Standards. Through this mechanism it will be possible to reduce the costs of developing costly data for scientists and engineers. Federal STI was exploding as the Federal R&D program began to grow. To cut costs and improve control of this literature, the Federal Clearinghouse for Federal Scientific and Technical Information was established and turned over to the Department of Commerce to operate. The need for a single agency that would provide referral services to Federal organizations involved in R&D resulted in the formation of the National Referral Center for Science and Technology at the Library of Congress. NSF agreed to provide the initial funding. About 120 information analysis centers were created in special fields to provide rapid, evaluated knowledge to users in and out of the government. They were located in centers of excellence in government and private sectors. Actions were taken by agencies to make the transfer of knowledge generated by the agencies' R&D programs to the private sector to stimulate technological growth. An examination of Federal library expenditures revealed that more than one-half billion dollars were being given to libraries without plan or program. Consequently, actions were taken to form the National Advisory Commission on Libraries. The National Commission on Libraries and Information Science was formed as a result of recommendations made by NACOL.

As described elsewhere in this book, some of these initiatives have met the test of time, while others failed to do so. The bio-medical and toxicological information networks have survived and prospered. The Clearinghouse for Federal STI became the National Technical Information Center, which has survived, but it is virtually self-supporting through sales rather than from appropriated funds. The National Standard Reference Data System is still operative, as is the National Referral Center for Science and Technology, although on a reduced scale. Many of the information analysis centers have disappeared; some exist in DOD, DHSS, and DOE. Most of the technology transfer programs exist or have been augmented, but agencies have kept them separate from their STI programs, for the most part. The U.S. National Commission on Libraries and Information Science still is active, but its funding has been kept on the low side by OMB and Congress, thus inhibiting its ability to make recommendations to Congress and the President. The 25 agencies mentioned earlier now number half or less. With the disappearance of COSATI and the OST STI program, coordination is very limited as is formalized information interchange among the agencies. President Johnson's call for Networks of Knowledge did not materialize, nor did the formal system of responsible and delegated agencies that

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were called for in the National Information System for Science and Technology.

Returning to 1968, an effort was made to obtain from each of the agencies of COSATI information to be used in the preparation of a background report on savings resulting from the agencies' skillful handling of STI.¹ More specifically, the memorandum called for a brief and informal list of savings made during the last fiscal year and the present one in the following categories: oral and informal communications, joint seminars, colloquia, travel reduction through use of conference telephones, use of microfiche in lieu of more expensive printing, use of author abstracts, selective dissemination of information, distribution of magnetic bibliographic tapes instead of hard copy, etc. The agency STI managers complained that that they did not have an "hard" data to give dependable answers. They also asked for additional time to "work up" the data. What became manifestly clear was that the /These ST I managers, except in some areas, did not have the data requested. data were not being gathered by the STI managers, nor were they authorized by their R&D managers to create the control systems needed to gather the data. It was a cul de sac that meant that the best we could get were estimates, a disappointing reality that reflected on the/seriousness of the agency/managers in building superior STI programs. The lesson was that the STI managers were being foreclosed from becoming total STI system managers with full responsibility for all funding, personnel, facility control, etc. The imposed ceilings resulted in a loss of creativity and innovation with the passage of time. Chalmers Sherwin ran into the same problem in seeking agreement on standards for/research project-reporting among the agencies. STI managers lacked control over project-reporting with a few major exceptions, DOD being one of these. Earlier, COSATI had established a Task Group on Dissemination of Information, whose purpose it was to make recommendations dealing with the release and dissemination of government-generated STI. The experience we had in getting information on savings

¹ Aines Andrew A, Chairman, COSATI, Memorandum to COSATI members, Subject: Cost Savings Through Information Management. May 22, 1968 , 1 page.

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did much to convince the OST staff that the easiest way to get information about Federal statutes and other agency authority to disseminate STI was to ask Dr. Hornig to send a memorandum directly to the FCST members over his own signature. The chairman of the Task Group, Colonel Currie Downie, claimed that his informal effort to extract information convinced him that more firepower was needed to obtain the data.¹

Another request for information was made by Alexander Hoshovsky, Panel on International Information Activities. In this instance, we were anxious to get information from individual agencies on their policies governing the foreign dissemination of STI. Based on the individual policies and the recommendations of the panel, a general policy was being prepared by the International Panel on international exchange of STI, one of the valuable contributions of COSATI described elsewhere in the book.² It is mentioned here because requests for key information were always being made to COSATI members, who often found it difficult to respond because of the lack of the requested data or because they did not have authority in their own agencies to compel those who had it to make it available through the STI focal points to COSATI.

While the Networks for Knowledge project was moving along slowly, considerable "outside" interest was being expressed. A representative of IBM, Michael Wascak, visited OST to discuss the program, for example. It was obvious/an effort to gather intelligence on his part, since he appeared to be relatively unfamiliar with developments in networking going on in the United States and abroad. Norman P. Ross of Time, Inc. met with Don Hornig and Doug Cater on the subject earlier. Ross discussed his concept of a marketable encyclopedia based on an electronic data bank. Aines expressed his personal view that the time was not ripe to sell "express STI to scientists and engineers" but when the cost of processing and transmission

¹ came down in the future, this was a strong possibility. Ross, who appeared to be Aines, Andrew A., OST, Memorandum for Dr. Donald F. Hornig, Chairman, FCST, Subject: A Request to the Agencies for Information, June 6, 1968, one page, Attached format for delivering the data requested, pp 4.

² Aines, Andrew A., Chairman COSATI, Memorandum to Dr. Leonard Karel, OST, June 3, 1968, requesting that he prepare a format for the request for data, 1 page.

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delighted with his reception and the networks for knowledge concept, stated his willingness to assist the program in a personal and corporate way.¹ While it did not bear directly on the Networks for Knowledge project, there were other stirrings outside of the government. R. Buckminster Fuller made a talk to representatives of Federal agencies on a World Resources Computer Center concept being sponsored by ^{Fuller} Buckminster/and the Southern Illinois University.² Here is an excerpt of Fuller's paper:

For the first time in the history of man..., all political theories and all of the concepts of political functions -- in any other than secondary roles as housekeeping organizations -- are completely obsolete...Here on Southern Illinois's campus we are going to set up a great computer program...We will store all the basic data in the machine's memory bank; where and how much of each class of the physical resources; where are the people, what are the trendings -- all kinds of trendings of world man? Next we are going to set up a computer feeding game, called "How do we Make the World Work?" We will start playing relatively soon, bringing people from all over the world to play it. There will be competitive teams from all around Earth to test their theories on how to make the world work...The comprehensive logistical information upon which it is based is our Southern University supported Inventory of World Resources Human Trends and Needs, also on the data and grand world strategies already evolved in the Design Science Decade being conducted, under our leadership at Southern Illinois University, by world-around university students...The "Game" will be hooked up with the now swiftly increasing major universities information network, supplemented by the world-around satellite scanned live inventorying of vital data. . .The game cannot help but become major world news. As it will be played from a high balcony overlooking a football field-sized Dymaxion Airocean World Map with electrically illumined data transformations, the game will be visibly developed and may be live-televised the world over by a multi-Telstar relay system...

While it is obvious that the Johnson Networks for Knowledge differed demonstrably from Fuller's initiative, there is a messianic twist to both of them, a McLuhanesque belief that the new information technology is a demiurgic force that will make things "better" for humanity. Fuller's views, as attractive as they may sound to the uninitiated, are as firm as the shifting sand. The capability of creating what others have called "a world brain" is not a serious expectation in this century.

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST., Subject: Weekly Communication, June 8, 1968, pp 3.

² Fuller, R. Buckminster, The World Game - How to Make the World Work, Washington, D.C., May 1, 1968, pp 3.

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There was also some discordance registered in yet another national information systems sector, the engineering information area. The various components in engineering professional society circles were at war, insofar as information systems were concerned. The (Engineering) Tripartite Committee was fully supportive of what it called the United Engineering Information System, but a powerful defector was IEEE. According to a visitor to OST, Dr. Frank Speight, secretary to the Tripartite Committee, the engineering committee was not moving rapidly to demand and organize a total engineering information facility. He explained that the difficulty of getting agreements and the grim economic facts of life were the main reasons for the attenuation. Battelle Memorial Institute was selected to prepare a long-term plan for the development of a United Engineering Information System to include system design specifications, a plan for system design, plans for implementation and operation, plans for initial funding and ways to achieve self-support, and ultimately plans for a new engineering information corporation.

After the meeting Aines wrote to Hornig: ¹

It is my belief that the monolithic center of the type being considered is not in the cards, unless sponsored (and supported) by the Federal government, a move that I do not favor. Additionally, I cling to the belief that the field of engineering, like the field of science, is simply too big for one information system.

Developments continued within COSATI. Dr. Richard Lesher, director of NASA's technology program, agreed to head the COSATI Task Group on Technology Utilization in place of George Howick of NASA, who was resigning from the government. Dr. Lesher is now the Executive Director of U.S. Chamber of Commerce in Washington, D.C.

Because of the slow progress being made by the COSATI group examining microfiche, dear s subject which was near and/to COSATI over the years, Dr. Harold Wooster, Office of Aerospace Research, was asked to chair a small ad hoc group to explore problems and make recommendations to COSATI. Discussions with Colonel Currie Downey, USAF, and Ezra Glazer of the Task Force on Dissemination of Information. They reported

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Weekly Communication, June 15, 1968 , pp 3.

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that most of the problems of dissemination of unclassified, unlimited distribution materials "results more from the way the agencies are organized to disseminate information than from any intention on their part to control the flow of information."

John Farmakides of NASA agreed to head a small ^{COSATI} group to study the problem of international copyright in science and technology.

Paralleling this effort was yet another committee on copyrights being formed by Abe Kaminstein, Registrar of Copyrights. Kaminstein had the very difficult task of upgrading the old Copyright Law. About this time, it was decided by Congress to form a Copyright Commission that would have the responsibility of examining all aspects of copyrights, but it was agreed that any input made by Farmakides and his panel would be useful to Kaminstein and the Commission to be. It also looked like the research project-reporting system contract was sufficiently amended to start the effort formally. NSF agreed to furnish the funds for the revised contract. Egged on by Dr. Philip Handler, Duke University, and chairman of the OST study on toxicology, discussions were held with Dr. Rice, Director of the NLM Toxicological Information program about the lack of progress in that program. Rice promised to take steps to expedite the program and this information was passed back to Handler. Ironically, when Handler became the Director of the National Academy of Science a few years later, his interest in STI programs seemed to have vanished completely. There should be a footnote on Kaminstein. During the early years of COSATI, he or a top-level member of his staff always attended the meetings and participated with warmth and enthusiasm. When he passed away a few years ago, some of the remaining participants in the early COSATI provided their own private eulogy for this fine public servant.

During the early 1960s, the STI affairs of the Department of Defense were closely observed by OST and COSATI. This was because DOD leadership had much to do with launching COSATI, because DOD was a pacesetter for the other Federal agencies in STI programs and services, and because the DOD leadership took a strong interest in STI matters. During the mid-1968 period, with the departure of Walter Carlson, a brilliant and able Director of Defense STI, problems began to develop, even though

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his able deputy, Walter Christensen took over as Director of Defense Technical Information. On one occasion, Dr. Donald McArthur, the head of the office in ODDR&E that was responsible for the STI program, called Aines to complain about the recruiting practices of NASA, who he claimed wanted to steal Walter Christensen to take the job that George Howick had left. Actually, Dr. Lesher had called McArthur in advance asking him for permission to talk to Christensen. Strong words apparently passed between the two of them, but the matter was dropped and the heat between the two agencies subsided.¹ Christensen explained his embarrassment to Aines because he found himself in the middle of the verbal fracas. Christensen also told Aines that his agency was taking steps to reduce the number of technical reports it was issuing, but would seek to emphasize reporting on the work unit reporting system "to use this wherever possible in lieu of a technical report, since it tends to be more concise and a technically meaningful document than the normal report. Technical reports will be normally submitted when special justification is furnished and when technical progress under the contract warrants the issuance..."² Christensen's logic was mystifying, since the work unit documentation was a device to report ongoing research projects, while technical reports were the fruit of the R&D process, when the work was concluded or being reported on when contract boiler plate so required. Actually, the reader of DOD reports would get a clearer picture of what resulted from R&D projects by referring to the two documents. In the same report to Hornig, Aines discussed a development in the Navy, a comprehensive review of a number of information programs - industrial, security, intelligence, management, logistics, etc. A board had been formed to do the job.

Aines wrote to Hornig:

As an inveterate critic of DOD for the inept management and coordination of its myriad information programs, this is a helpful development if something good comes of it. The Navy is not unique in setting up committees at times not solve problems but to give the impression that it wants to solve them. These are image-retaining or lightning rod efforts,

¹ Ibid, page 2.

² Aines, Andrew A., OST, Report to Dr. Donald F. Hornig, Subject, Weekly Communication, June 15, 1968, pp 3.

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however, whatever comes out of the Navy effort will be better than the zero effort that exists.

Years after writing this, I probably would be kinder than I was, but it still concerns me that information management systems in DOD and other Federal agencies are not better than they are, despite the intervention of OMB in information resources management and countless recommendations made by GAO and other critics.

While it was feasible to prepare a policy statement on the interchange of STI with other countries by COSATI, and even get it approved by the members of FCST, it was patently evident that there was real weakness in international information activities, largely because of a lack of a responsible Federal mechanism with this responsibility and the pragmatic needs of Federal agencies, who were involved with other countries in the exchange of information, to work out agreements in the present, in absence of needed strategies and tactics. For months, there was an effort to get AID and State Department officials to fill the vacuum. Dr. Erwin Lachman of AID finally prepared a draft document on "A New Role for Scientific and Technical Information for Foreign Assistance."¹ As mentioned to Dr. Hornig¹

(The paper) falls far short of recommending a lively program, although I can understand this with the funding problems of AID. Lachman also prepared it to take refuge under the protective wing of the Networks for Knowledge project, since Mr. Gaud, his boss, as you are aware, is a member of your Networks for Knowledge panel. Still (the concept) is a step forward...For a few million dollars a year, we could make a real impact on the problem of developing countries.

Unfortunately, the Lachman approach - in keeping with his agency's mission - was focused only on the United States and its relations with developing countries, not the total international community. Although AID sought to play an intelligent role in its overseas programs, especially in its foreign reading rooms where U.S. STI was popular, nothing came of the Lachman paper and our hopes that AID would strengthen its program.

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: The Weekly Scan, June 22, 1968, PP 3,

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During 1968, a group of developing countries, under the leadership of India, proposed that they should not be restrained by international copyrights in using the STI and other knowledge protected by the copyrights conventions. Abe Kaminstein, the Register of Copyrights, called a large group of people interested in this problem together to discuss the Indian gambit. This led to a note to Hornig, part of which is quoted, as follows:¹

I suspect that the erosion of ground under Kaminstein's feet, resulting from the rough treatment of his Revised Copyright Bill, is causing him to seek new territory (as a diversion). It is my view that India should be dissuaded from giving the impression that she is willing to "pirate" the intellectual property of a class of people whose good will she would want in the long pull. On the other hand, I believe that the advanced countries should take a few concrete steps to make it easier for the developing countries to get (STI) materials so that they will avoid desparate acts.

In the same memorandum, Aines informed Hornig about a recent ICSU-UNESCO meeting dealing with information analysis centers. An attendee of the meeting, Dr. Edward Brady, Department of Commerce, a member of COSATI, stated that a subcommittee on the Evaluation and Compression of STI was formed. One result of the meeting was a series of recommendations to: encourage the formation of new information analysis centers; form a central UNESCO office to coordinate these centers and provide information about their programs and products; develop education programs for scientists on how to use specialized information services; urge professional societies to develop standards for selection and refereeing of articles for journals, also to urge authors to make better use of one major world language; propose better ways to translate and distribute important information appearing in lesser known languages or obscure journals; and others. Ultimately, this panel became the CODATA panel that exists today, whose general secretary is Dr. David Lidee of the National Bureau of Standards.

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director OST, Subject: The Weekly Scan, June 22, 1968, pp 3.

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The same memorandum to Hornig contained yet another item on international information, this a letter from Hideo Yamashita, who headed up the Japan EDP Education Mission/^{team,} which had recently visited OST and was addressed by Aines. Yamashita wrote:¹

All the members, including myself, are truly grateful for the great kindness shown by yourself and your organization on the occasion of our visit. We were strongly impressed by what your organization is doing, and we intend to study the information and advices we have received at your organization with a view of putting them into effect in Japan.

What impressed the Japanese team to be so lavish in its praise? I pointed out to them that the sweepstakes to make and market computers was important but not the key requirement for the information society of the future. What should really be understood is the need to raise the general level of a country to employ modern information technology in a superior way. A country with this competitive advantage would be able to undertake new programs and projects that would guarantee its leadership. When pointing out this truism, I really thought that I was talking about how the United States intended to advance its leadership. Apparently, Japanese recognized this as a challenge that they wanted to meet. In his letter, Yamashita quoted some statistics that reveal an interesting baseline when compared to what is happening in Japan today. He wrote:

Japan is second to the U.S., having 3,000 computers in operation, about 1,000 built overseas (presumably the United States). Japan, at that time, had a capability of manufacturing only 1,000 computers a year. Of the 3,000 computers only 220 were in government use, the rest being in industry, commerce, agriculture and schools. Only 2 percent of the computers are used in information management. The only networks in use included: a national police information system, a labor market information system, social insurance, national railway, Nippon Telephone and Telegraph Public Corporation, and banking systems. Time-sharing systems were still in the offing.

¹ Aines, Andrew A., OST, Memorandum to Donald F. Hornig, Director, OST, Subject: The Weekly Scan, June 22, 1968, pp 3.

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The problem of the lack of compatibility of mechanized information systems was, during the late 1960s, a matter of deep concern among information managers and policy-makers. Mechanized information systems were beginning to grow in the United States, Europe, Japan and in other countries. We began to increase our complaints that insufficient action to solve the problem was being taken in the United States and in other countries, stressing the view that efficiency and economical processing of the world's knowledge would bring benefits to all countries. Since we were deeply involved in the Organization for Economic Cooperation and Development (OECD) information policy and computer utilization programs, we encouraged OECD to take a lead in the internationalization aspects of information interchange across national boundaries. Aines wrote on this subject:¹

All nations which desire to use the international information bank must participate in the development of conventions, codes, standards and other devices that are basic to the usefulness of the information systems or take the risk of future isolation. Failure to undertake programs to assure compatibility will not necessarily inhibit the growth of individual information systems and sub-systems, but will probably result in added costs and elaborate translation programs to obtain interchange between information banks in the future.

He then proposed a few principles that would have a bearing on solving the problem. These included:

A uni-system is manifestly impossible to organize. Obstacles to true compatibility of individual systems are overwhelming, but working towards the goal is still desirable. This is not a problem that will be solved by "muddling through." We should apply our efforts to ad hoc and piecemeal solutions, recognizing that any one country lacks the talent and resources to do it all. To conclude that convertability is the only approach would bring us to a cul de sac. Research, development and experimentation in new techniques offers us the best return, moreover, we should be careful about developing an information system that might reduce the open-endedness of science and technology. One thing for sure, working towards solutions in isolation from one another is not the way to go.

Among the recommendations made by Aines were the following:

A terms of reference document should be prepared and submitted to OECD for consideration by the member countries. If OECD agrees that the project

¹ Aines, Andrew A., OST, Memorandum to David Beckler, OST, and Dr. Burton Adkinson, NSF, Subject: The Compatibility of Mechanized Information Systems, July 2, 1968, pp 4.

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was worthy and resources would be provided, a special group should be formed to attack the problem. Member countries would provide the required expertise to assure progress. In addition, it was recommended that OECD form an advisory group to assist the expert panel. Consideration should be given to discussions with representatives of the Soviet Union to determine its level of interest with the OECD group or in parallel. The recommendations also called for grafting the program onto on-going information programs, either than starting de novo.

Although most of the members of OECD were sympathetic to the project, it became evident that the burden of providing experts and resources would be greater than they were able to provide. The consensus appeared to be that the project should be undertaken in the future and that the Unesco UNISIST program should consider sponsoring it.

One of the special enjoyments that lightened the difficult task of achieving gains in the Federal and national STI area was working with Dr. Stephen Rossmassler, an extremely capable and engaging scientist loaned to OST by the National Bureau of Standards. Bright, perceptive and understanding, much admired by the Federal STI community, was Steve Rossmassler. Asked to think about our problems, Rossmassler wrote:¹

Here are a few thoughts on strategic planning for the next few months. Even in OST we do not have a general recognition of the vital need for top level attention to information problems. Only Beckler on the staff (David Beckler) seems to be aware of our efforts. Our best bet for agency-based cooperation is the FCST membership which ought to be approached individually. We might call for an OST-based Review Panel for COSATI. This group could also interact with the FCST members. It might be useful to get them involved with the Peet, Marwick and Livingston study on Federal R&D project information programs. COSATI members themselves to not appear to be hostile to the PML report, but neither are they in favor of significant OST action. (It should be pointed out that few of the COSATI members had full responsibility for agency project-reporting programs, in all fairness to them.) It would be useful if our panels could concentrate on a single, highly significant issue in the next few months, and to deliver a product with real impact. We could also look at major OST concerns - environmental quality, reorganization of science in the Government, etc.- to see if there is an opportunity to define issues and develop solutions. We might think about this at the individual agency level. If we could only concentrate on a few forward-looking projects, functioning on an initiating

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Rossmassler, Stephen A., OST, Informal Memorandum to Andrew A. Aines, Chairman, COSATI, July 11, 1968, pp 4.

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rather than reacting mode. I recognize that [this is what you did in the National Engineering Information Conference and the SATCOM review; we simply need more of these.

Rossmassler's advice was always warmly accepted. This splendid public servant was a mainstay of the National Standard Reference Data System and helped bring it into being. It brought great sadness to OST and COSATI when he prematurely passed away a few years later. He continues to be missed as one of the team of capable STI managers that did so much to create the Federal information systems in the 1960s. He is also missed as a good friend who made every day at OST appear to be brighter.

Since Dr. Rossmassler was the Executive Secretary of COSATI during his period at OST, he focused primarily on the matters that COSATI was working on, but it would be wrong to say that OST was taking a more restricted approach during 1968. Examples are seen in matters appearing in a weekly report to Dr. Hornig.¹

The first item described an OMB examiner's meeting with Zwick of USIA. The discussions were largely about the directions taken by that agency as well as its effectiveness. The second item told of a meeting held with members of the State Department, the National Science Foundation, and Mel Day, Chairman of the COSATI International Panel. It was State's feeling that OECD was successful and that we should put our full weight behind it, and, in our case, its information programs. I pointed out that I agreed in principle, but it was not always easy to get OECD to move in directions that were favored by the United States. For this reason, while we would patiently work through OECD to accomplish mutually agreed upon ends, we would continue to look for targets of opportunity to work with other international groups and bilaterally with other countries. The third item dealt with a luncheon discussion on ARPA's networking program. Walter Baer, Chuck Kidd, Nick Golovin, and I represented OST and Taylor represented ARPA. We all agreed that some of the most important work

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Highlights of the Last Week, July 7, 1968, pp 2.

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in computer networking was going on at ARPA, and that OST would continue to throw its support behind that program. Another item reveals the fear of the computer that was evident during the late 1960s, a fear that is still widespread two decades later. At a hearing on the subject of computer privacy, Senator Long (D., La.) stated:

The capacity of the computer to store, retrieve and massage tremendous amounts of data threatens to eliminate the individual's right of privacy as never before. What are the potential invasions? First, the Proposed National Data Bank (by BOB), and such other computer banks designed to store names and information on citizens. While the National Data Base is stalled, others are cropping up. Cities, states, and private organizations are in the process of collecting data, and even the American Bar Association plans to provide a central data bank on disciplinary actions which occur within the legal profession...The so-called checkless, cashless society is a second potential invasion of privacy.

The note to Hornig contained an additional comment. "The reason I trot this out is to remind us if the Networks for Knowledge project flies, we will have to make clear does that the kind of networks we are advocating / not involve potential invasion of personal privacy.

During this period, the Networks for Knowledge initiative received considerable internal attention within OST. Dr. Nicholas Golovin, OST, made an independent appraisal of the Networks for Knowledge concept. Among his observations and conclusions were the following:¹

Cost-benefit studies are needed on all phases. A "blue sky" approach should be avoided. The COSATI project on National Information Systems for Science and Technology appears to involve Federal more than national programs. Need a statement of sound reasons for establishing K-Nets: improved quality and lower system costs for example. Tasks for agencies should be outlined, including research on operational, regulatory, and financial aspects. NSF and OST should study government-supported STI programs in physical and medical fields as a control and test vehicle that could play a TVA-like role for U.S. K-Nets. Departments of Commerce, Transportation and Labor, together with the Council on Economic Advisors, might work on a modern networks for business and economic information. DHEW and NSF might establish a network for library and educational services. An FCC communications task force could develop regulatory and rate structures for the communication industry to provide direct support for K-Nets, also estimates of subsidies needed. USIA could determine the usefulness of communications satellites to assist developing countries.

¹ Aines, Andrew A., OST, Memoranda to Dr. Donald F. Hornig, Subjects: Networks for Knowledge, July 8, 1968 (pp 3) and July 9, 1968 (pp 7).

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Golovin also suggested that NSF chair a Federal committee to draft a proposed organization and time-phased action plan, also a Presidential message. Finally, he recommended:

An experimental operational network to computerize and tie together the main sources of information concerning the status and results of federally-supported R&D programs.

A revised Biomedical Communications Network, limited to acceptable cost/benefits and an analysis and research program.

A proposal for a demand/cost/benefit research study of a national network for economic and business knowledge.

Another research proposal for a similar study for an educational K-Nets using modern technology.

In his second memorandum to Dr. Hornig (July 9, 1968) on the subject, Aines made the following points to Dr. Hornig:

The Golovin paper reveals a lack of consideration of certain international considerations: work already going on under the auspices of OECD, ICSU-UNESCO, FID and other international groups. These include international systems in nuclear energy, space, chemistry biomedicine, etc. No recognition was being given to the all-out international rivalry going on, also to the work being done by OST, COSATI, NSF, ACS, AIP and other groups. These represented considerable efforts that have led to the development of a set of de facto K-Nets. The Golovin approach seemed to assume that government "intervention" was a problem, while from the start OST had recognized legitimate roles for the public and private sectors.

Aines also pointed out that the oft-repeated call for PPB/cost/benefit studies as a precondition was overdrawn, although fiscal realities and responsibilities had to receive attention in the final K-Nets plan. The President's overall goal should not be a hostage to a financial statement at this early stage. In reality, achievement of K-Nets would have to involve both the public and the private sectors; we had not yet thought through how this would be done. The President should have to be involved in the statement of intersectoral interaction and cooperation. There was also a need for a central entity not discussed by Golovin. The National Systems Task Force had already found that no progress would come unless there was a central entity equipped with needed resources to get the job done. Aines also pointed out that the implied criticism of the NLM Bio-Medical Communications Network program was "overdrawn," the result of inadequate homework on Golovin's part. Another concern expressed by Aines was the lack of analysis evident in Golovin's paper about the national leader-

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ship role. Aines wrote to Hornig:

It seems to me that quite apart from the merits of K-Nets development, more weight should be placed on highlighting the U.S. leadership role in communications and information-processing arts and especially on our desire to use the new technology for actual interchange of specific banks of knowledge in science, technology and education. A lot of information R&D investment in the public and private sector is going largely into equipment, but more resources will be needed to get full utility, i.e., profitable and efficient use of the knowledge banks. The United States can pioneer here through the K-Nets concept. (Underlining added.)

Aines then suggested that Hornig keep in mind the following when he next reported to the President on K-Nets:

We need more amplification on the role of OST as the focal point, in conjunction with NSF and the other Federal agencies. OST should take a reasonably creative, but cautious approach because of huge costs of providing and dispersing modern communications and information-processing equipments, also the lack of necessary infra-structure -- physical, educational and social--ready to use the new information technologies around the world. It would be necessary to build K-Nets on the foundations of present information systems, but the new systems would have to be user-oriented so that it would provide wanted services to real users. The President should announce the designation of a limited number of K-Nets responsible agencies such as NASA (space), AEC (nuclear energy), HEW (biomedicine), USDA (agriculture), ESSA (environment) DOI (water resources), and DOC (critical data). DOD could help the engineering community, and NSF would continue to help professional societies. Because this would legitimize what is already happening, there would be no strong reaction. The President could announce a ten-year program and call on all countries of the world to participate in the plan. He might also announce a series of demonstrations in 1968 and 1969 using communications satellites. He might also want to address a special message to Congress on the subject of K-Nets and what we should about creating them.

The record does not show if Dr. Hornig discussed K-Nets matters with the President as recommended, nor does it reveal any subsequent discussions with Nick Golovin about his appraisal of K-Nets. Future developments dealing with the status of the President explained why implementation of President's original proposal made at Williamsburg never came to pass.

Dr. Hornig did remind me in an interchange of memoranda that any notion that I had the about/overall goal of the project-reporting system that would permit it to be used outside of the government did not match what he had in mind.¹ Hornig stated:

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig (untitled), July 24, 1968, 1 page. Hornig's note was written on the bottom of the same memo.

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that he never viewed the program of information exchange "as a generalized information exchange as much as enabling us and the agency managers to know what is going on." The contractor was immediately informed that his study would be confined to consideration of government interchange only. Ironically, over the years, the system evolved largely in the direction of broader sharing with non-governmental information users. The discipline needed to require agencies to use the R&D project information system prior to undertaking new R&D projects began to disappear. When Smithsonian turned the project over to the National Technical Information Service at the recommendation of OSTP without funds or manpower, there was further erosion, and the intergovernmental interchange feature continued to deteriorate.

During this period, COSATI continued to operate. The COSATI Panel on Information Sciences Technology, chaired by Dr. Ruth M. Davis, demonstrated the COSATI Information Sciences Technology experimental research project Remote Access Information System. Dr. Edward Brady completed an updated version of the Directory of Federally-Supported Information Analysis Centers, a COSATI document listing 113 centers covering a wide spectrum of science and technology. Dr. Sidney Passman, chairman of the COSATI Task Group on the Technical Report, announced the completion of his committee report, which was printed through the courtesy of the Arms Control and Disarmament Agency. Passman was a member of the ACDA staff at the time. The COSATI Panel on Management of Information Activities took on the task of obtaining cost data on their STI programs for a COSATI report on that subject. This was anything but an easy task, since few, if any, had an organized system to gather DTI cost data. Colonel Currie Downie, USAF, and Ezra Glaser, the chairman and secretary of the COSATI Task Group on Dissemination of Information were winding down their effort to gather an inventory of the Federal agencies' policies on the dissemination of STI. John Farmakides, NASA, agreed to head a small study group to look into international copyright problems for COSATI. This group was also designated to interact with the Register of Copyrights (Library of Congress), the State Department, and Senator McClellan's committee which had just introduced Senate Joint Resolution 172

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which provided for the automatic extension of copyrights. This was before the establishment of the Copyright Commission which Congress was in the process of bringing into the picture. Dr. Harold Wooster, Office of Aerospace Research, consented to head up a COSATI Panel to study the acceptability of microfiche. This medium was starting to grow, even though there were many users who resisted microfiche use. Discussions were held with Dr. Charles Rice, Director of the NLM Toxicological Information Program, just getting started and short of funds and other resources. Dr. Philip Handler, Duke University, who had headed up the Toxicological Information Study for PSAC, was clamoring for faster action from NLM. Dr. Handler was to become the Director of the National Academy of Sciences. Plans were prepared for ^aCOSATI National Systems Task Force workshop to be held at a USDA facility at Front Royal, Virginia, during the last week of June 1968. Arrangements were made with Dr. Richard Lesher, who headed up the NASA technology utilization program, for him to become chairman of the COSATI Task Group on Technology Utilization in place of George Howick, (NASA) who was leaving government service. Several years later, Dr. Lesher became the Executive Director of the U.S. Chamber of Commerce. Finally, to make the COSATI Subject Category List more useful, tables were prepared that made possible the conversion of the list to Interagency Field of Science Codes with the approval of the FCST Interagency Committee on Fields of Science. The COSATI list was designed primarily for the classification, storage and retrieval of STI. It included end products as well as fields of science. The interagency list, on the other hand, served as a practical, simplified basic system to be used for the classification by fields of science on the funding of research.

While on the subject of funding, COSATI prepared a breakout of Federal agency costs of STI for Fiscal Year 1968.¹ The review showed that Federal STI costs had risen

¹ Aines, Andrew A., OST, Memorandum to Dr. Donald F. Hornig, Director, OST, Subject: Estimate of FY 1968 Costs, Weekly View and Review, July 29, 1968, pp 5.

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from \$380 million in 1965 to \$530 million in 1968. Aines qualified the figures in his note to Hornig, thusly:

We have not rationalized how to use AID and USIA figures in the estimates. (There was recognition that these agencies were involved in STI programs but there was no way to determine to what extent. Somehow there should be a footnote in future estimates.) I am not satisfied that our totals are accurate because agencies have not developed the capability of breaking out and assembling the data or have interpreted the definitions of the cost categories in such a way as to provide "conservative" dollar figures. My goal of accuracy of agency reporting is not to show that a larger cut of the budget is going into science communications, but to force STI managers to find out the extent of their agency expenditures as a prelude for future PPB exercises. My argument for accurate figures boils down to the observation that an agency cannot manage its program effectively unless it knows the size, composition and resources going into the program.

During the late 1960s, a warm relationship with the information managers of the United Kingdom existed. Dr. Harry Hookway, then director of the Office of Scientific and Technical Information in the British government had to be considered the leading figure in the British STI area. He had also been chairman of the OECD Information Policy Group for several years, thus very familiar with what was going on in STI programs on both sides of the Atlantic. Working closely with Hookway was Dr. John Gray, also of OSTI, who regularly attended OECD Information Policy Group meetings as the U.K. representative. They were joined by Mr. Cyril Giles, British Ministry of Technology, who also sat on the OECD panel. Hookway and Gray focused on information research and development and support of scientists and professional societies. Giles, on the other hand, accented technology data, technical document-handling, and technology utilization. Hookway and gray were the scientists, Giles the archetypical engineer. There was a certain amount of competition between Hookway-Gray and Giles. Hookway expressed his hope that some common ground could be found between NLM's MEDLARS and Holland's Excerpta Medica. During a discussion with the three Britains in London, the two groups asked for meetings with OST -- separately.¹ Hookway also wanted to visit with NLM. A research study of OSTI was described

¹ Aines, Andrew A., OST, Memorandum for Donald F. Hornig, Ivan Bennett, and David Beckler, all of OST, Subject, Report on OECD Meeting and Other Matters, 22 July 1968, pp 6. The London meeting took place on 14 July 1968.